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THE EVOLUTION OF PHYSICAL THERAPY IN MEDICINE *

NATHAN H. POLMER, M.D.

NEW ORLEANS

The American Congress of Physical Therapy was founded eighteen years ago by Drs. Roy Fouts and A. F. Tyler of Omaha. This association has not only followed the progress of physical medicine but has contributed largely to its scientific evolution. Indeed many of the names connected with our Congress have been bright lights in our country's medical literature. Progress in physical medicine has been slowly and painstakingly achieved by men like our members interested in studying, applying, observing and recording the effects of the various physical agents on the human body. The labors and researches of these men should be of interest to all who use and practice physical therapy. Therefore I will ask you to turn back to pages of medical history and briefly review with me the Evolution of Physical Medicine in America.

The first electrical observation in the New World had to do with the astonishing behavior of Mrs. Susanna Sewall's garments. The sparks which emitted from her wearing apparel so greatly disturbed the Rev. John Clayton that he communicated these observations to Robert Boyle of England, in 1653. Later the good parson writes: "How it should transpire through the pores, and not be inflamed by the joint motion and heat of the body, and afterwards so suddenly to be actuated into sparks by the shaking or brushing of the coats, raises much my wonder."

Alexander Garden of Charleston, South Carolina, in whose honor the gardenia was named, described in a letter dated August 14, 1774 a curious fish "called the electric eel . . . . whose shock seems to be wholly electrical." In the Philosophical Transactions under date of September 3, 1773, appeared a communication from Dr. Hugh Williamson of Philadelphia in which he described a large eel which was brought to that city by a sea-faring man. "It had the extraordinary power of communicating a painful sensation, like that of an electrical shock, to people who touched it."

Whence came these sparks of fire, these electric shocks? Who wields the strange manifestations of this electric force? These and many other questions remained a mystery and still require some elucidation.

Franklin's Contribution

The outstanding event of eighteenth century electricity was the experimental demonstration of the identity of the electric spark and lightning. In the middle of the eighteenth century when unrest was brewing in the colonies, the mind of one of the masters of science was well as of statesmanship was engaged in electrical experiments. Although we associate the name of Benjamin Franklin with the printing press, lightning rod, and early stove design, with post offices, saving banks, libraries and educational institutions, we are primarily interested in the role played by him in the application of electricity to disease. Franklin was our first American scientist. Through his wide acquaintance with physicians he acquired a familiarity with medicine perhaps not possessed by the average practitioners of his day. Peter Collinson, a member of the Royal Society, sent to Philadelphia, in 1747, what was perhaps the first friction machine to be imported into this

* Presidential Address Delivered at the Nineteenth Annual Session of the American Congress of Physical Therapy, Cleveland, Ohio, September 3, 1940.

country. Franklin at once commenced his novel and interesting researches. This practical minded thinker was not content to merely draw the electric fire from the heavens. He wanted to harness the electric spark for useful purposes. Therefore with his Leyden jars, and his static machine he opened a clinic on Green Street in Philadelphia. Fortunately for science and mankind Franklin's letters have been collected and published by Collinson.

In a letter to Dr. John Lining of Charleston, dated March 18, 1755, Franklin describes how he electrified a young woman for "some indisposition." In contrast to the literature on medical electricity of his day, which consisted of a jumbled accumulation of laudatory testimonials, Franklin's letters and discussions are noted for their candor and sagacity. In a letter to Sir John Pringle he remarks that he "never knew any permanent advantage from electricity in palsies and goes on to say that "perhaps some permanent advantage might be obtained, if the electric shocks had been accompanied with proper medicine and regimen, under the direction of a skilled physician."

By the end of the eighteenth century electricity had been drawn from the clouds by Franklin, produced experimentally by Galvani, and its mysteries further unfolded by Volta who in the year 1800 announced the invention of his cörona de tasse for generating this wonderful electric force.

Among the early American publications was one by Dr. T. Gale, of Troy, New York (1802) entitled "Electricity or Ethereal Fire . . . . . Comprehending Both the Theory and Practice of Medical Electricity; and Demonstrated to be an Infallible Cure of Fever, Inflammation, and Many Other Diseases." (What more could one ask of a text?) In 1798, Gale visited New York City and was given permission to treat several convalescent yellow fever patients with static electricity.

An "Epitome of Electricity and Galvanism" was published anonymously by two gentlemen of Philadelphia in 1809. In 1817 "The Ethereal Physician, or Medical Electricity Revived," was published by Thomas Brown and Jesse Everett of Troy, New York. These individuals had no medical training. They also sold electrical machines and vouched for the competency of their customers to give electrical treatments. This of course was before the establishment of the Council of Physical Therapy, and of the Registry of Physical Therapy Technicians.

In spite of the remarkable claims made for medical electricity during the early part of the nineteenth century, it failed to fulfill the extravagant expectations that had been formed of it and consequently it fell into disrepute. In fact it was confused with and shared the fate of mesmerism.

Electromagnetic Induction

In 1831, Michael Faraday gave a new impetus to electrotherapy by the discovery of the induction coil. Joseph Henry, a teacher of mathematics in the Albany (N. Y.) Academy working independently contributed a similar discovery. Gradually electromagnetic machines began to be manufactured with more power and a greater reliability of output.

The first scientific treatise on electrotherapy entitled: "Notes on the Medical Application of Electricity" by Dr. William F. Channing was published in 1849 by Daniel Davis, Jr., who styled himself a magnetical instrument maker of Boston. The text reviews the work of the best European authors of the day, including that of Dr. Golding Bird. The reports from American clinicians include the treatment of narcotism with electromagnetism by Dr. Th. S. Page of Valparaiso. "The first application from the left to the right side, through the heart produced convulsive motions, and, at the fourth contact the patient cried 'no more.' Dr. Dewees of New York

observed, in 1847, that in syncope and exhaustion "the sense of weakness fully as well overcome as by the administration of brandy or wine." The most elaborate electrotherapeutic apparatus then manufactured by Mr. Davis could be purchased for thirty-five dollars. This of course was complete with electrodes, conducting cords, and the like.

A fairly comprehensive book on "Medical Electricity; Embracing Electro-Physiology and Electricity as a Therapeutic" was published by Alfred Charles Garratt of Boston in 1858. It was not, however, until the enthusiastic work of George M. Beard and Alphonso David Rockwell that medical electricity began to be again used by the profession. Their work, "Medical and Surgical Electricity," which first appeared in 1871, went through ten editions. It presented the world's knowledge on the subject in a thorough and attractive form, and introduced for the first time into medical practice the methods of general faradization and general galvanization. Europen workers up to this time had used only local applications for therapeutic as well as experimental purposes.

In 1875, Charles E. Michel, an ophthalmologist of St. Louis, first applied electrolysis for the removal of superfluous hair. In 1881 William J. Morton of New York described "A New Induction Current." This is a current of high potential and low amperage which is used for tissue contractile effects. This current was extensively used and written about by Drs. W. B. and M. L. Arnold Snow, Titus, DeKraft.

Georges Apostoli, of France, popularized the heavy galvanic currents in gynecology. His work was enthusiastically received in America, and several works on electricity in gynecology appeared in the latter part of the nineteenth century. Among them we might mention "Electricity in Diseases of Women and Obstetrics, (1892) by Franklin H. Martin the late founder and director-general of the American College of Surgeons. Horatio Bigelow published "Gynaecological Electrotherapeutics" and edited "An International System of Electrotherapeutics" (1894). G. Betton Massey published "Electricity in Diseases of Women" and later "Conservative Gynecology and Electrotherapeutics."

Dr. Massey was also the founder and first president of the American Electrotherapeutic Association. The organization meeting with twelve Foundation Fellows was held at the New York Academy of Medicine in January 1891. That organization, which played an important role in the evolution of physical medicine during the first quarter of the twentieth century, was incorporated into our Congress in 1933, and its journal "Physical Therapeutics" likewise incorporated into our official journal the ARCHIVES OF PHYSICAL THERAPY, so ably edited by Dr. Disraeli Kobak.

In 1893, the sinusoidal current was introduced to American medicine by Dr. John Harvey Kellogg and also by Dr. William James Morton working independently.

High Frequency Currents

To d'Arsonval, the French physiologist, belongs the distinction of being the first to pass a high frequency current through the human body for the production of heat without other disagreeable effects. This was in February 1891.

Nikola Tesla experimenting at about the same time delivered in May 1891, an historic lecture before the American Institute of Electrical Engineers, in which he stressed the fact that currents of high frequency and high potential (voltage) could be passed through the body without harm. He also called attention to the fact that electricity in this form might prove of value in the treatment of disease.

Monell describes that memorable night, in May 1891, when Nikola Tesla, young and enthusiastic, stood before that body (American Institute of Electrical Engineers) and "with smiling countenance and without physical sensation he placed himself in currents that by all the laws of alternating or continuous currents should have brought the lecture to a close by the death of the daring lecturer. Yet he went sweeping on, astonishing his audience by demonstration after demonstration of unfamiliar discharges, new born into electrical science and christened with the name 'High Frequency'." That lecture sent the fame of Tesla around the world.

The first clinical application of the high frequency current in this country was made by Frederick de Kraft in the office of William Benham Snow, of New York, in 1906. The development of apparatus out of which efficient diathermy equipment was evolved dates back only to 1910. At that time Snow states it was "possible to produce upwards of 300 milliamperes. Monoterminal applications with a variety of vacuum and non-vacuum glass electrodes soon gave way to the biterminal application of diathermy with mesh, and block tin electrodes which could be appropriately cut, smoothed, and applied to the part under treatment."

Among the early carefully controlled observations on the clinical application of diathermy was Harry Eaton Stewart's "Diathermy and its Application to Pneumonia," which appeared in October, 1923. Since then a wide clinical experience has been reported by many observers. The pioneer work of Granger, Elsom, Sampson, Snow, Titus and others helped standardize diathermy technic in the United States and prepared the way for its extensive use in the army and post-war work. We are told that from 1918 on over a million diathermy treatments have been given annually in the government services alone.

From the application of heat to one part, the application of diathermy by means of bifurcated cords was extended to several parts. In 1930, by the use of very large electrodes, diathermy was employed for fever therapy or hyperpyrexia by King and Cocke, and Neymann and Osborne. I will not enter the controversial subject of priority in this method.

Since then several hundred articles have appeared in the literature on this phase of physical medicine alone. An international Congress on Fever Therapy was held in New York City in 1937, under the leadership of Drs. Walter Simpson and William Bierman. Fever therapy has been employed by means of many physical agents, such as hot air, hot baths, hot packs, hot blankets, by diathermy, by radiathermy; by long wave, by short wave; by heated cradles; by air conditioned cabinets.

In 1924, Schereschewsky, of the United States Public Health Service, studied the biologic effects of short wave currents. While European investigators were the first to apply the short wave currents for local pathologic processes in man, the American investigators Whitney, Page and Carpenter are credited with being the first to study and use the short wave currents for fever therapy. Since 1930 short wave diathermy has been extensively used in this country and we are indebted to Bierman, Coulter, Osborne, Kobak, Kovacs, Krusen, Titus, Wolf, Zeiter and others for instructions in its clinical application. On account of its easier application, its deeper and more uniform heating ability, with less likelihood to produce burns it appears that short wave diathermy is superseding long wave or conventional diathermy. Short wave diathermy may be conveniently applied by air spaced condenser electrodes, by cuffs, by pads, or by the inductance cable.

Electrotherapy is but a part of the vast spectrum of physical medicine. A part can never be greater than the whole. Consequently in practice most

electrotherapeutic applications are preceded by or followed with some other form of physical medicine such as radiant light and heat, hydrotherapy, massage, exercise and occupational therapy.

The aim of physical medicine and modern scientific medicine in general, is not alone to carry a sick or injured individual through the effects of an illness or accident, but to restore that individual to his ability to work and play as quickly, as easily, as painlessly and as economically as possible. In this rehabilitation and functional restitution program physical medicine plays an important role. It proved its worth during the first World War, when for the first time the medical profession thought in terms of "physical reconstruction and rehabilitation." The impetus given physical medicine by Dr. Frank B. Granger, who directed the physical therapy activities in the Surgeon General's office, and by the physical therapy staffs of some twenty-seven base hospitals and convalescent centers was reflected in the advancement of physical medicine in the post war days.

The loyal cooperation and efficient service rendered by the physiotherapy aides, many of whom had to be hurriedly trained to meet the demand, received the commendation of medical staffs and patients alike. To date over eleven hundred trained technicians have been examined and certified by the American Registry of Physical Therapy Technicians which operates under the auspices of this organization.

To prevent the costly trial and error method of evaluating the efficacy of physical therapeutic apparatus, the Council of Physical Therapy, of the American Medical Association, has examined and approved many forms of equipment, thereby protecting the profession as well as the public against inefficient and possibly dangerous apparatus.

An extensive bibliography on various phases of physical medicine is listed in the Quarterly Cumulative Index and in the Index Medicus. Authoritative articles are published in the ARCHIVES OF PHYSICAL THERAPY and in the Handbook of Physical Therapy. A Year Book of Physical Therapy and a number of excellent texts, many of them written by active members of our Congress, have appeared in recent years.

We fervently hope and pray that the time will not be distant when peace and good will, will once again radiate in their resplendent beneficence on the face of the world, but in this hour of our country's peril, and in line with our government's policy of preparedness, the American Congress of Physical Therapy stands ready, able and willing to do its share to help preserve that philosophy of life and way of living that we in America call "democracy."

THE EFFECT OF COLD, HEAT AND WEATHER ON THE HUMAN BEING *

WILLIAM F. PETERSEN, M.D.

Professor of Pathology, University of Illinois College of Medicine

CHICAGO

Physical therapeutists are primarily interested in one thing; namely, so to alter the human organism that resistance to disease is increased, either generally or locally. The objective is to change the "condition" of the body — that intangible term whereby we indicate an alteration or "state" of tissue reaction to the environment.

When one approaches the problem by physical therapy, one applies some form of energy directly (massage, heat or cold, or the other forms of energy of different effective wave lengths). To this should be added diet, hydration and dehydration, exercise and rest. By these means one seeks to restore a normal balance to the organism. Presumably one utilizes the method and the philosophic background of the Greeks, and I know of no safer or more useful approach.

Hippocrates regarded the organism as in an unstable equilibrium, delicately adjusted to every environmental impact; disease occurred when this balance was distorted, pushed to one side or the other, either locally or generally. He put it this way:

> He must also take exercise. For food and exercise, while possessing opposite qualities, yet work together to produce health. For it is the nature of exercise to use up material, but of food and drink to make good deficiencies. And it is necessary, as it appears, to discern the power of the various exercises, both natural exercises and artificial, to know which of them tends to increase flesh and which to lessen it; and not only this, but also to proportion exercise to bulk of food, to the constitution of the patient, to the age of the individual, to the season of the year, to the changes of the winds, to the situation of the region in which the patient resides, and to the constitution of the year.
>
> A man must observe the risings and settings of stars, that he may know how to watch for change and excess in food, drink, wind and the whole universe, from which diseases exist among men. But even when all this is discerned, the discovery is not complete. If indeed in addition to these things it were possible to discover for the constitution of each individual a due proportion of food to exercise, with no inaccuracy either of excess or of defect, an exact discovery of health for men would have been made.[1]

If we want to know something of the condition of an individual, it might seem fitting that we should first study normal individuals to see how they differ day-by-day. For it must be obvious to those who deal in physical energy and watch its effect as applied to the human in therapy, that every energy impact alters the organism. If that is true, then we must study the major demand made on the body by nature; in other words, adjustment to weather.

All we have to do is again turn to that most ancient and, at the same time, most advanced medical thinker whom I have already quoted, to find that in his great introductory work, "Airs, Waters, Places,"[2] he took cognizance of this with the dictum that if you want to study medicine, you must first study meteorology.

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* From the Department of Pathology, Bacteriology and Public Health, University of Illinois College of Medicine, Chicago.

* Read at the Nineteenth Annual Session of the American Congress of Physical Therapy, Cleveland, Ohio, September 3, 1940.

As a matter of fact, he was the world's first meteorologist and coined the term. He did more than that. He insisted that all disease was due to interference with processes which today would be called oxidative.

He was not only interested in the immediate effects of weather but in those of the seasons and of the changes in man's reaction to intercurrent intervention when the body differed because of preceding environmental effects. "One should be especially on one's guard against the most violent changes of the seasons, and unless compelled one should neither purge, nor apply cautery or knife to the bowels, before at least ten days are past." Note two things here: First, his recognition that periods of seasonal change, particularly the equinoxes, were critical in their effects; and secondly, the observation that it took approximately ten days for the body to recover after a severe disturbance. This corresponds precisely to the time interval that we normally expect for a similar change in reactivity to a sensitization.

The recognition of the importance of the effect of weather, or the air mass in which we live, loomed very large 2,500 years ago and is now merely

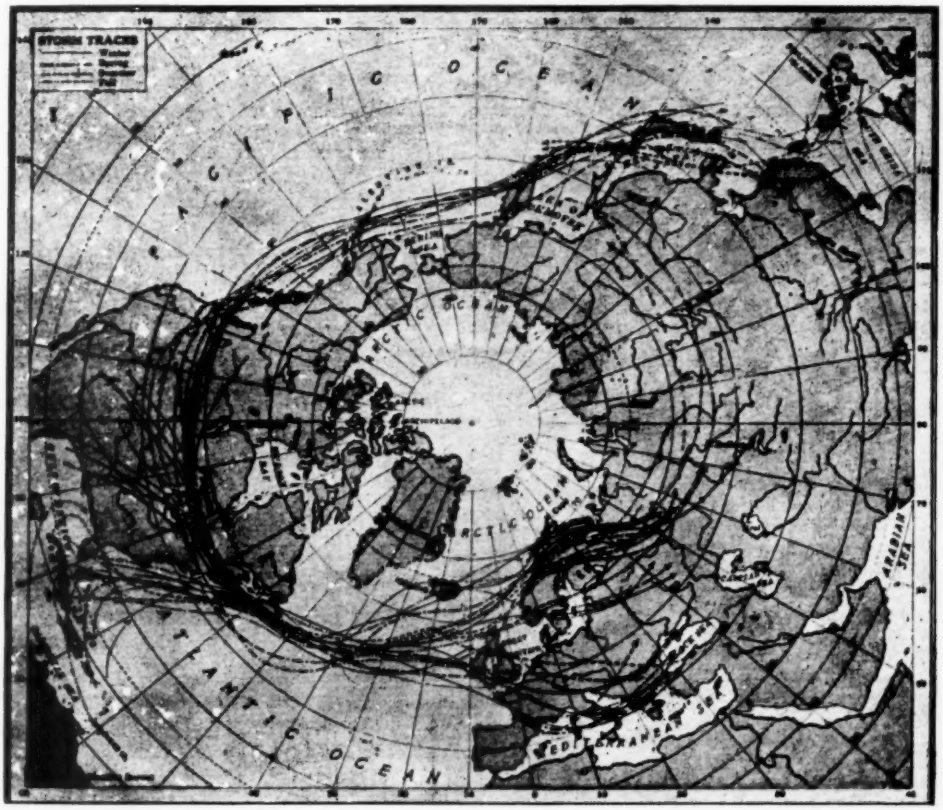


Fig. 1. — Circumpolar group of the cyclonic tracks in the Northern Hemisphere. U. S. Weather Bureau. Note the concentration of the tracks over the northern part of the United States, over England and North Europe, and over the northern portion of the Mediterranean.

coming back as we realize that when we seek the cause of disease, we rarely have to do with one factor — we deal with many, i.e. a constellation of forces.

Why should we as Americans be particularly interested in weather? Probably for one fundamental reason: we have more weather to contend with! To illustrate the fact that we here in Continental America are subject to greater environmental strain I merely append two graphs, one the storm

tracks as they circle around the northern hemisphere (fig. 1) and the second the pathways of the storm tracks as they cross America (fig. 2). Note particularly the concentration of these pathways in the region where we are assembled.

Weather

Without going into scientific meteorology,[3] we can simplify the subject by stressing the significance of the fact that we as human beings living in these storm tracks have to deal with a constant passage of alternating cold air masses and relatively warm air masses. We speak of these as "polar air masses" or "tropical air masses." When we breathe one, we are breathing a type diametrically opposite to the other. The polar air mass consists of dry, heavy, clear cold air which moves across the continent at a somewhat slower pace than the cyclonic or "tropical air mass" which is whirling in a counterclockwise direction (therefore the term cyclone) and which involves lighter, warmer, more humid air, containing more particulate matter. At the interface of such air masses, precipitation (rain, snow, fog, and the like) is very

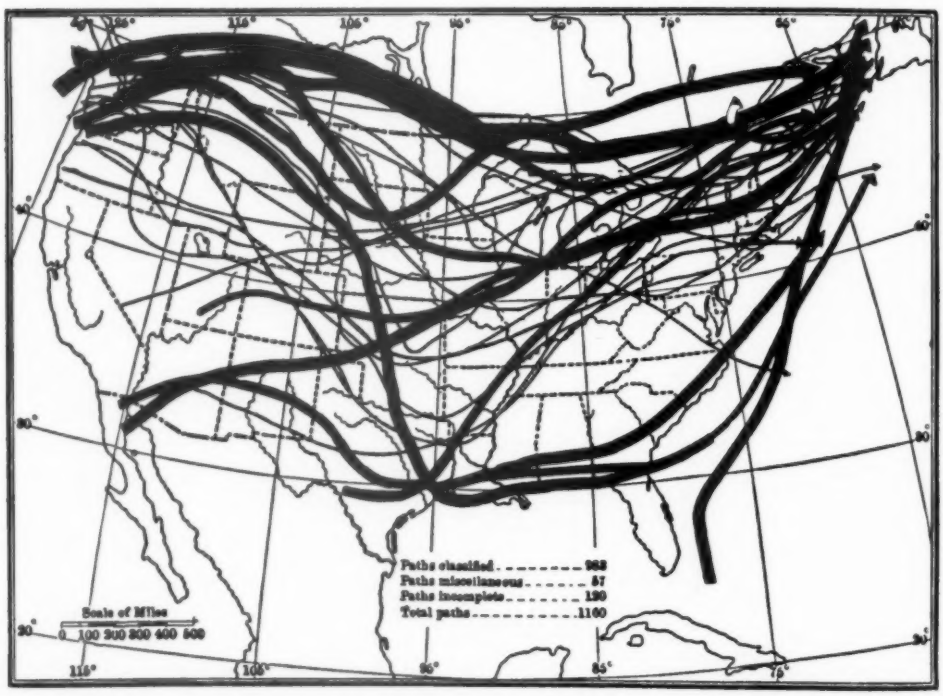


Fig. 2. — The storm tracks over the United States (Van Cleef of the U. S. Weather Bureau). Note the general trend of passage from the northwest over the midcontinental region and point of exit along the northeast coast.

apt to occur. In midcontinental regions such as those provided by the North American Continent or the Great Asiatic land mass, temperature fluctuations reach their greatest magnitude and, as a consequence, the individual there domiciled must make tremendous physiologic adjustment from day to day. With proper clothing and shelter, life under such conditions is still possible for the normal individual and indeed the fluctuations in the air mass are probably the main factor in bringing about the stimulation, the energy drive which is so characteristic of peoples domiciled under these conditions. But the constant variation also brings with it the possibility of autonomic fatigue and, of course, the old individual, the very young individual, or the sick

individual becomes much more susceptible to the meteorologic change to which we must adjust ourselves. As a result every physiologic adjustment necessitated by weather alteration is apt to find reflection in any region of the body that is inadequate, and this will find expression either in unusual symptoms, in change in function, or in actual pathologic development in the different organs of the body.[4]

There are many implications for everyday medicine. We are, for instance, constantly carrying a variety of bacterial organisms on our mucous membranes but in most instances they do not penetrate. If, however, the physiologic function of the mucous membranes is constantly pendulating, we can readily see that at certain phases bacterial penetration may be more readily achieved. Infection can then result. The common "cold" is a typical example but a similar pendulation in resistance from day to day can be followed for poliomyelitis,[5] for scarlet fever,[6] or for any of the common infectious diseases with which the body normally has to contend.

So, too, the possibility of a change in resistance to intoxication or infection or trauma or therapeutic intervention must be envisioned. Macht,[7] many years ago, noted that when he tried to standardize digitalis it was not possible unless he considered barometric pressure in the equation. My colleague, Nedzel,[8] has found that there is a constant rhythm of toxicity for experimental animals, no matter what the pharmacologic substance with which we deal. Obviously the same thing must be true for intervention of the type we use in physical therapy. Ellinger[9] showed quite a number of years ago that the effect of light on the skin may be totally different in the spring than in the autumn.

Now while I have discussed some of these unusual effects of the environment, particularly the weather, in making life difficult for us, the picture has its sunny side, too — that is, a long-range sunny side. Hippocrates noted that the northern European was a tough and hardy individual by comparison to the Asiatic, who lives under a much more equable meteorologic condition.[2] The day-by-day demand on the autonomic adjustment ultimately results in the elimination of weaker organic strains, and it makes the survivor more hardy and more resistant because during his whole lifetime, weak strains of cells in the various organs are being eliminated and replaced by descendants of stronger survival strains. While we cannot prevent aging, we face the paradoxic situation that the longer we live the more hardy we become.

In our region of the world no meteorological situation is ever repeated. Not only does each day differ but every season and every year differs to some extent in its demand on the population. I can illustrate this in its simplest form if we merely study the monthly index of barometric variability (which gives us some criterion of the demand on the population) and compare it to the monthly deaths for Chicago. In the accompanying graph it will be noted that we have a series of three-year rhythms of increasing amplitude reaching maxima in 1923, 1926, and 1929 and in each instance we have a corresponding increase in deaths which parallel the increase in environmental demand (fig. 3). When we Break down the deaths for the years 1928-29 into different age groups it becomes apparent that infants and children from 1 to 10 reveal a striking seasonal curve for mortality, but that in the group from 10 to 20 this seasonal curve tends to flatten out, only to reappear again in individuals who die at ages over 20. In other words, the individual between the ages of 10 and 20 is best able to adjust the environmental demands (fig. 4).

My own approach to this entire study has been made by means of day-by-day chemical determinations of the blood and urine as well as clinical

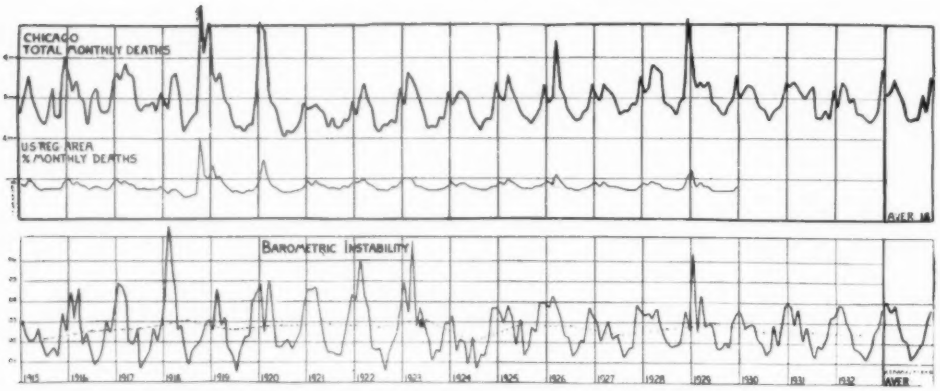


Fig. 3. — Index of barometric variability for Chicago, 1915-1932, with superimposed monthly mortality curve for Chicago. Note seasonal character with greatest meteorological variability in January, February, and March and the relative quiescence in July, August, and September. Annual trends can be observed with three periods of increase to 1923, 1926, and 1929, with corresponding increase in crude mortality rates.

and physiologic observations on normal individuals as well as on those sick from a number of different diseases. It would lead too far afield to discuss all of these, but I should like to stress the following facts that have been developed as a result of these studies.

The Reaction of the Body to Weather Change

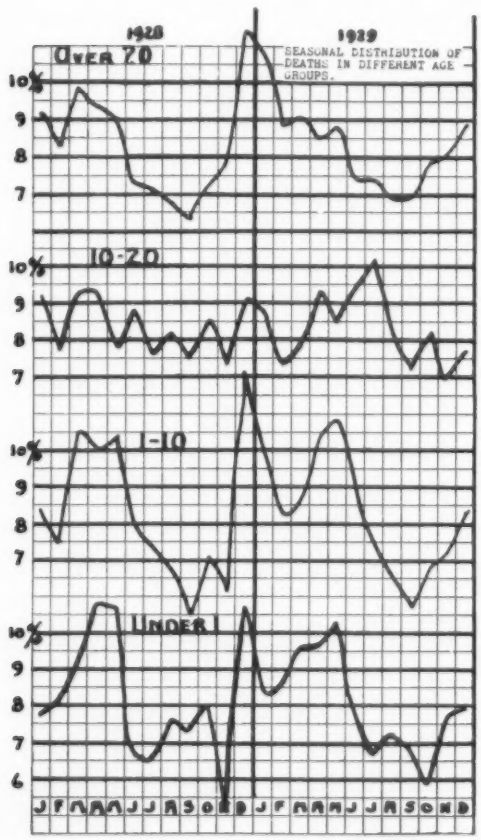


Fig. 4. — Crude monthly mortality figures for Chicago by age grouping for the years 1928-29. Characteristically greater seasonal susceptibility for infants and children and for the age group over 70.

In the first place single blood chemical or other clinical determinations are valueless because all biologic processes of the body are in a constant flux as the effort is made to keep the organic processes in balance, the while the organism as a whole is living in an unstable environmental situation. Not only must the organism adjust itself to different demands of work, of digestion, the demands of fundamental endocrine rhythm (menstrual cycle), demands that are associated with minor infections, trauma, sensitization, and the like, but the individual must also adjust himself to emotional situations and primarily to this constant pendulation of the atmospheric environment to which I have already referred. Here chemical adjustment becomes apparent in any of the chemical balances which we may follow, whether it is the blood pH or CO_2 content, the chloride or phosphate level, the K/Ca ratio, the blood pressure, the basal metabolism, or the electrical resistance of the tissues. In a general way every period of passing cold is associated with an increase in blood pressure. This is due to the fact that the

peripheral vascular bed tends to close, there is an endocrine rearrangement with liberation of constrictor substances from the pituitary and adrenal glands and we can speak of a relative "sympathicotonia," a "pressor crisis" or the "alarm reaction" of Selye.[10] I have designated such a phase as the ARS* or the "stop" phase because during this time there is a relative anoxia in large areas of the body, there is a trend toward reduction, there is an increase in blood sugar, and, of course, evidence of vascular spasm. Such a reaction may be subjectively experienced as a period of "stimulation" by the individual because, with increasing blood pressure, he is apt to feel buoyant and energetic. From the metabolic point of view, however, there is at this time no increase in the basal metabolic rate.

Winter and Spring Fatigue. — After this reaction, the reversal sets in (COD** phase). Then blood pressures fall, the vascular bed begins to dilate, the blood becomes relatively acid, the CO_2 content increases, the basal metabolism is definitely increased, the K/Ca ratio is diminished, and tissues tend toward hydration; that is, the capillary walls become more permeable and fluids tend to leave the vascular bed. At such a time the individual is apt to experience the feeling of fatigue and during this period bacterial penetration is more apt to occur. A repetition of a series of ARS phases associated with the repeated cold waves of the winter, finally results in the characteristic late-winter or spring phase of fatigue which the population at large reflects by a high mortality and greatest morbidity.

Spring and Autumn Recovery. — With increasing environmental temperatures this trend is reversed, the organism becomes more alkaline, and with hot weather an alkalotic crest may be reached. In this summer phase basal metabolism tends to be diminished, blood pressures usually again decline because of the dilatation of the peripheral vascular bed; the alkaline load is increased, and an accumulation of minerals, vitamins, and the like, takes place so that at the end of the summer or early autumn biologic fitness reaches its maximum.

As far as the reaction to unusually high temperatures is concerned, we need merely turn to the two unusual mortality episodes of recent years; namely, the heat wave of 1934, and the second heat wave experienced in 1936. It is rather interesting in this connection to observe that women were relatively more susceptible to these heat deaths than men. Women are provided with a greater fat padding in the skin and subcutaneous tissues and when placed under heat conditions of this type, this insulation apparently renders adjustment to heat more difficult, despite the fact that normally their basal metabolic rate is lower than that of the male.

Blood Pressure

I should like to illustrate the vascular reactions by means of a series of curves of day-by-day blood pressure readings made on normal individuals and on patients. The first is that of a physically normal young woman whose only health difficulty consisted in occasional fainting attacks. Inasmuch as she was steadily employed, this caused some inconvenience. These fainting attacks merely call attention to the fact that her vasomotor system was unusually labile and the attacks of fainting always occurred in the wake of periods of undue cold. With the passage of a cold air mass her blood pressure would reach unusual peaks but these were not noted by her as far as any symptom was concerned. It was the after-effect, namely, the period of unusually low blood pressure that followed these crests that was associated

* Anoxia — Reduction — Sugar Increase.
** Catabolism — Oxidation — Vasodilatation.

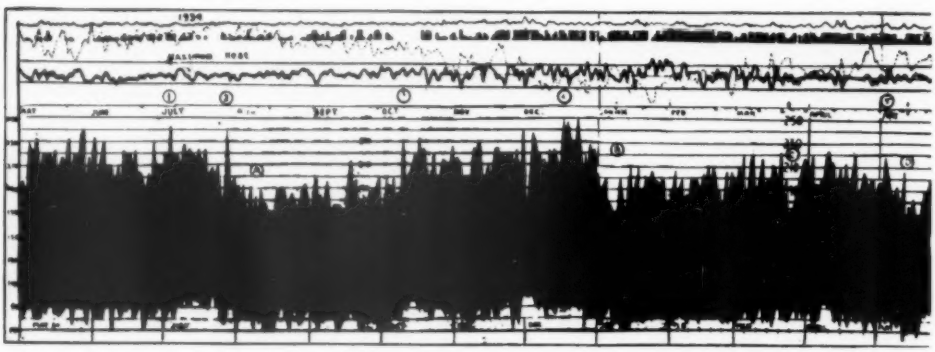
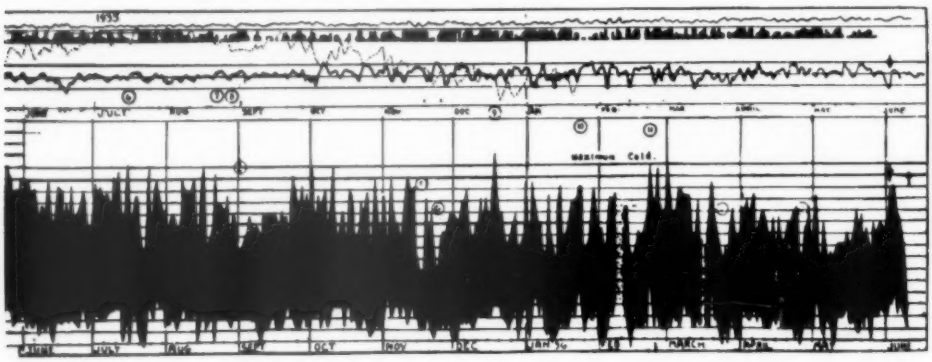


Fig. 5. — Day-by-day blood-pressure determinations on subject McG. for the period from May, 1934, to



June, 1936. The patient was under constant hospital supervision.

with periods of fainting. Such an individual, if placed in an equable climate, would naturally have no symptoms of this type. In this instance we were able to overcome the difficulty by merely increasing the general level of her blood pressure by small doses of ephedrine and by alkalinization.

In the next graph (fig. 5) the day-by-day blood pressure of an old woman suffering from senile dementia is illustrated. A casual glance will suffice to reveal the variability in a day-by-day determination of blood pressure.

I can perhaps best illustrate the mechanism involved here by a diagram (fig. 6) in which the first blood pressure curve (A) merely illustrates the relatively normal range of an increase in systolic and diastolic blood pressure due to any intercurrent stimulus, whether a change toward a cold air mass, an infection or trauma, or emotional upset. The increase is followed by a perfectly normal decrease in blood pressure, at which time the organism would show maximal stimulation. Recovery from this would swing the pressor levels back to a normal range.

In the next diagram (B) the sequence of two such episodes is shown and now we note that after the unusual secondary systolic crest there follows an unusual fall in blood pressure as a cumulative event; in the third diagram (C) a situation that would obtain seasonally is illustrated when a series of environmental impacts raise the systolic levels to unusually high points and then an accumulation of capillary-active substances finally brings about tremendous stimulation (or fatigue) with periods of unusually low blood pressure. It is obvious that at the systolic crests we might anticipate

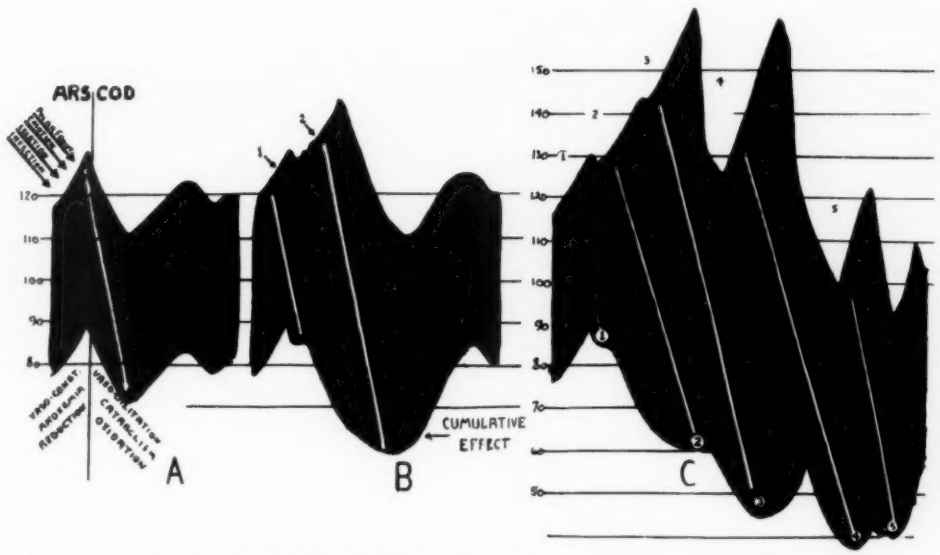


Fig. 6. — Diagram of systolic and diastolic blood pressures to illustrate summation effects of environment with resulting pressor crests and periods of unusual diastolic lows.

rupture of defective blood vessels, while at the diastolic lows we might anticipate thrombosis.

If the patient differs in biochemical and physical status from day to day, from season to season, and if individuals of different habitus or sex differ in their reactions, then it must be obvious that our various physical agents must be used in a way that will take cognizance of the state of the person and the weather. Let me illustrate. In a case reported by Hoverson[11] we can examine the following reactions:

Case Report. — The patient was admitted to this hospital on November 26, 1932. He then weighed 132 pounds, and was 5 feet 9 inches tall. His physical examination disclosed no pathologic findings other than pupils that reacted sluggishly to light changes, but well in accommodation. The blood Wassermann and Kahn 4+. The spinal fluid Wassermann was also 4+, with a negative Pandy reaction and 11 cells present. The large gold curve was 45322111000. He was classified as a case of general paresis, cerebral type.

On December 19, 1932 this patient was given his first artificial fever therapy by our specially devised electric cabinet. The highest temperature desired and reached was 106 F. and the treatment was considered satisfactory.

On December 23, 1932, he was given another treatment which was started at 8 A.M. At that time the temperature of the patient was 98.4 F., the pulse 96, and the respirations 20. At 9 axillary temperature was 100.6 F., pulse 100, and respirations 24. The patient was perspiring profusely. At 10 the axillary temperature was 104.4 F., pulse 108, and respirations 24. The number of lights in the cabinet was reduced by one-half. Fifteen minutes later the axillary temperature was 104.8 F. This was checked by a rectal temperature which was the same. The lights were turned off now. At 10:30 o'clock the rectal temperature was 106.2 F., pulse 136, and respiration 26. The patient was perspiring profusely at this time, and according to our rules of treatment was removed from the cabinet and placed in bed. He soon became restless and combative, and was handled with much difficulty. The temperature continued to rise in spite of ice cold baths and sponges and by 12 o'clock was 110.5 F., the pulse was not obtainable; respirations over 60 per minute; the patient was cyanotic and comatose. From this time on the temperature dropped rather rapidly and at 1 o'clock the rectal temperature was 102.8 F. and thereafter came down as usual and was normal at 7:00 P.M. The pulse was not obtained until 3:15 P.M. when it was 120, and the respirations were then 32 per minute, though progressing favorably with the temperature.

At the height of the temperature the patient was given strychnin and adrenalin intravenously in small doses every 3 minutes. Artificial respiration was necessary from 12 to 12:30 P.M.

During the next 4 days the patient was apathetic and listless, but gradually grew stronger, and at the end of 4 days appeared to have reached the state normal to time prior to this treatment, in fact was alert mentally, and was more cooperative than before the high temperature.

A spinal fluid examination 2 weeks afterward gave a 4+ Wassermann reaction, negative Pandy, and 19 cells per c.mm.

Since this episode he has been given several similar heat treatments, and in no case has the temperature risen beyond our regulative temperature of 106.2 F. We have no explanation to offer for the extreme rise.

Let us examine the weather at this time. The small meteorogram (fig. 7) illustrates the meteorologic situation and incidentally the fallacy of thinking in terms of means or averages when we think in terms of human reactions to the weather.

The official weather record for the month discusses this as follows:

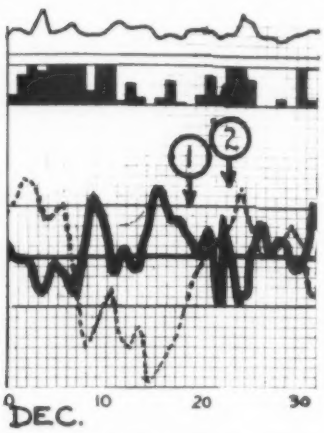


Fig. 7. — Fever therapy on December 19th (1). Normal reaction. Repeated on December 23rd. Result — restlessness, combativeness, rectal temperature 110.5. Pulse not obtainable. Respiration 60. Patient cyanotic and comatose. Ultimate recovery.

December averaged exactly normal in temperature while the precipitation was somewhat in excess of the normal. The month was notable for its decided reversals in temperature. The first six days were abnormally mild, the next two weeks abnormally cold, while the remainder of the month, except the last day, was another period of abnormally high temperature. The only sub-zero temperature of the year occurred on the 15th and 16th — the first such occurrence in almost three years.

Actually we observe that the patient had his first treatment on the 19th and this was after the passage of a severe cold wave, four days after the barometric crest; temperatures varied on the day between 19 and 32 F. and humidity was relatively high.

But he got his second treatment after the passage of a remarkable cyclone which had varied the barometric pressure almost an inch within 24 hours and the temperature had in the meantime risen to 44 F. and barometric pressure was rapidly falling.

In other words, the physical condition of the patient on the 19th was totally different than on the 23rd because of the physiologic experiences in the way of adjustment to environmental changes which had to be equilibrated.

Therapeutic Implications

If the organic phase pendulation which has been described is of significance in bringing about situations which at certain times cause disease symptoms and at other times bring about amelioration, or improvement, then therapeutic intervention must be approached with the idea of modifying organic rhythm. We can consider a few possibilities in a diagrammatic fashion in figure 8.

We shall assume that the organic status may be illustrated by a mere pH level of the venous blood* and in the first graph the normal biochemical rhythm is supposed to pendulate between 7.30 and 7.40. When the level is pushed too far toward the alkaline side on a certain day a headache may be initiated. With recovery the level may be pushed to the acid side and the patient's rhythm may actually remain at such levels that the patient is relatively free from symptoms for a time.

We can relieve a patient by removing the focus, or isolating the focus from some of the autonomic vascular connections (curve A).

* Actually, of course, innumerable mechanisms enter into the picture of the labile balance.

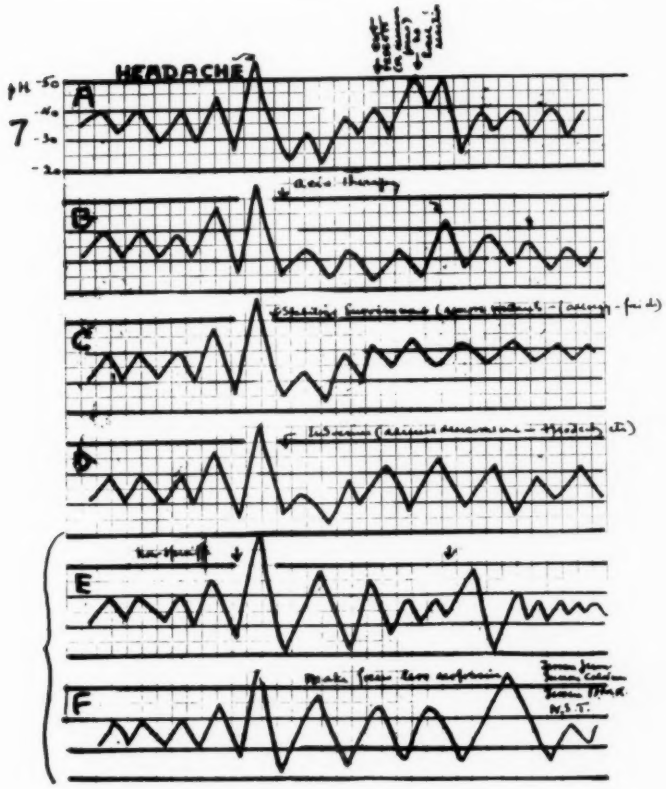


Fig. 8. — Diagram to illustrate various therapeutic procedures. Pendulation of autonomic tone indicated by pH curves with headache precipitated at the alkalotic crest. *A*, amelioration by isolation of focus (operative intervention); *B*, amelioration by acid therapy; *C*, amelioration by stabilization of environment and the removal of undue irritants (allergic, toxic, focal infections, etc.); *D*, amelioration by improving endocrine balance; *E*, non-specific intervention including physical therapeutic measures; *F*, improvement as the result of increasing resistance of the focus.

In this instance we can cut the nerves that pass along the meningeal vessels or cut the vessels themselves. Then when the next general phase of relative alkalosis occurs, the focus will no longer react as it did before and the patient will have no headache — but, of course, will still be a "headache" patient in the sense that other symptoms (such as those of the gastrointestinal tract, secretory symptoms, vascular symptoms) may still become pronounced at such a time.

Or, instead of removing the focus or isolating the focus, we can place such a patient on relative acid therapy or in some other fashion bring about an increased production of acid products and in this way lower the general level of the pH; under such circumstances, as shown in curve B, the episode which normally would push the relative pH to a high level will be modified and no headache will occur (curve B).

In the third place (curve C), we can place such a sensitive individual in a stable environment or remove all irritants including allergic irritants or foci of chronic infection. That will bring about a similar result and will tend to stabilize the individual.

We can approach the problem by making an effort to balance the endocrines (curve D). If a period of relative alkalosis and sympathicotonia is associated with a sudden entrance of vasoconstrictor substances (as from

the adrenals) into the blood stream, with a resulting pressor crest; then, if we lessen this output, or increase the production of an opposing factor, as, for instance, thyroid, the trend will be toward stabilization, with lessening of the opportunity for headache. In this way we make an effort to establish a better balance. A very common factor in the disintegration lies in the domain of the sex hormones.

We can approach the problem from the point of view of non-specific therapy, and particularly physical therapy (curve E). If, for instance, on a particular day we inject some substance that will bring about a violent swing in the autonomic reactions as at the point indicated, we may actually initiate a headache as the end result of our particular intervention. However, as an after-result the organism becomes relatively stabilized and the amplitude of autonomic rhythm will be decreased. Then when some other intercurrent phenomenon which disturbs the equilibrium takes place, the individual may be in such condition that the pendulation is not so great and the threshold for a headache or other autonomic distintegration will not be reached.

We can approach the problem from another point of view, that is, to make the focus itself less responsive by using substances that will lessen the permeability, the sensitivity, or the reactivity of the cells (curve F).

Finally, I would call attention to the whole problem involved in the vascular balance that exists between the peripheral tissues and the individual organs whereby the blood mass can readily accommodate the physiologic demands initiated by environmental effects. Here the physical therapeutist has at his disposal an immense tissue area, highly reactive, of profound physiologic importance, wherewith he can, by summation or negation of effects, bring about a whole series of therapeutic effects in the deeper tissues.

While it is true that at the present time our results may not always be certain, the problem is one that can be solved and I have the impression that its solution and the achievement of greater certainty in therapeutic effects will be advanced if we keep before us the picture of the ever changing physiologic status of the total organism. We can revert back to the old notation of Hippocrates that "it is necessary to discern . . . the constitution of the individual, the age of the individual, the season of the year, the changes of the wind, the situation of the region in which the patient resides, as well as the constitution of the year." For us the changes of the winds are particularly important because the weather has much to do with governing the physiologic status.

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(Concluded on page 566)

FEVER THERAPY BY PHYSICAL MEANS IN DERMATOLOGY *

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and

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Clinical applications of artificial pyrexia in dermatologic conditions dates back to the middle of the last century. The therapeutic value of fever was recognized long since by Tillmans,[1] Bazin[2] and McVail.[3] McLeod[4] reported favorable results in mycosis fungoides following intercurrent erysipelas. Tulipan and Director[5] secured encouraging results in generalized dermatoses by the intravenous use of typhoid vaccine. Bierman[6] observed temporary but favorable effects in scleroderma and mycosis fungoides by radiothermy.

Since the introduction of artificial fever by physical means, its therapeutic scope in skin disorders has been broadened. Experience has demonstrated that this procedure is most effective in dermatoses commonly considered as intractable and subject to recurrence. Internists and dermatologists now share the opinion that these skin affections are merely mirror images of functional or organic disorders obscured within the body. Such a basic concept lends support to certain biochemical and physiologic findings which in turn afford theoretic evidence of the mechanism involved in fever therapy.

Important Physiologic Principles

Beneath the integument and between it and the underlying fascial and muscular structures is a large lymph space. It is because of this space that the skin of certain animals such as the rabbit, when removed, peels off like a glove from the hand. This great lymph space plays an important role in metabolism, since during the height of chemical exchange it is distended with lymph, while at rest it empties itself and remains collapsed. It is reasonable to assume that much of the general body chemistry is carried on in this space and at times it is probably surcharged with toxic metabolic products.

Leading from the subcutaneous lymph space to the surface are a series of coiled corkscrew like ducts (fig. 1). These ducts are surrounded by fibroelastic tissue capable of expansion or contraction. The physiologic mechanism suggested is that normally the function of this set-up is to cause momentary delay in the excretion to the surface in order that proper separation between colloids and crystalloids can take place.

A second important physiologic factor is body temperature regulation by the skin. In this function the skin and subcutaneous structures work in close harmony with the central and autonomic nervous systems. Barbour's[7] classic experiments revealed that when cold was applied to the thermogenic center in the brain base, immediate vasoconstriction with blanching took place at the periphery. When heat was applied the opposite ensued. This suggests the close relationship between the central nervous system and peripheral

* Read at the Southeastern Sectional Meeting of the American Congress of Physical Therapy, Jacksonville, Florida, July 10, 1939.

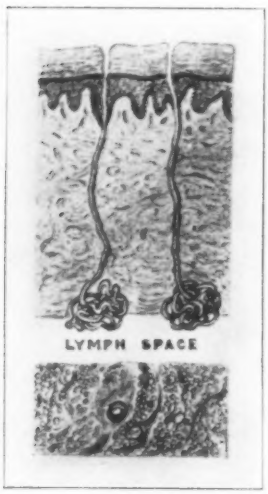


Fig. 1. — Sagittal section of skin showing great lymph space, coiled ducts and their communication to surface.

skin function. Likewise the close connection between skin function and autonomic nervous system balance is well recognized.

It can be readily understood from these principles that metabolic, endocrine, or central and autonomic nervous imbalance may exert a vital effect on the welfare of normal skin metabolism, and if carried on over long periods, leads to chronic impairment of function. A vicious circle thus set up by surcharging the great lymph space with irritative toxins may reflect its effect back to the central origin, and in turn create a continuous skin dysfunction until some force succeeds in breaking the cycle.

Methods of Fever Production by Physical Means

It should be obvious from this physiologic discussion that the method of fever production is of great import. In the normal there exists a definite gradient between the skin and internal body temperature. The skin functions normally at a much lower temperature than that of the interior. Neymann and Holmquest[8] have shown this difference to be as much as 4 C. In skin disorders, especially with excretory function already impaired, this gradient should be maintained if possible during fever therapy. This can only be attained by some means of penetrating heat used for inducing fever which leaves the skin cooler and free to eliminate.

Thus it becomes self-evident that external heating or baking devices which depend upon first heating the skin to a high temperature and then conveyed to the deeper structures in order to produce the fever, are reversing a normal physiologic gradient. So neglected has this consideration been and so fraught with potential danger is this neglect, that it becomes necessary to emphasize in detail some of these fundamental principles.

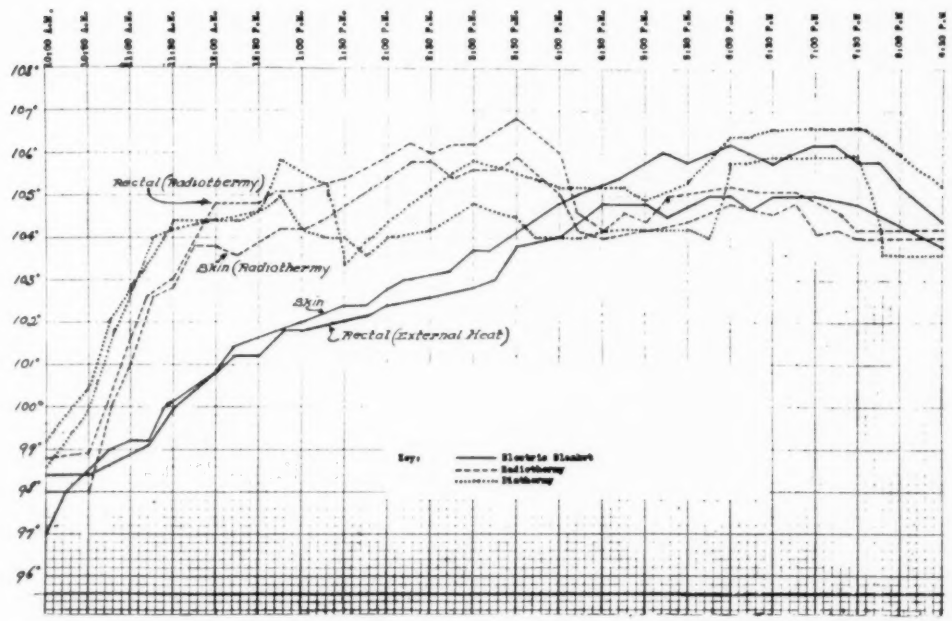
Graph 1 illustrates the gradient between rectal and skin temperature by actual measurement during fever production by external heat (electric blanket) and penetrating heat (diathermy and radiothermy). It will be noted that with penetrating heat the rectal temperature remains higher than that of the skin during the entire fever induction. With external heat this physiologic gradient is reversed.

In some dermatologic conditions, skin function is severely impaired including the body temperature regulating ability. Under fever treatment by external heat we have twice experienced a temperature rise to 108 F. within the first fifteen minutes of treatment. Such an observation has never been experienced in numerous treatments of a like condition by penetrating heat.

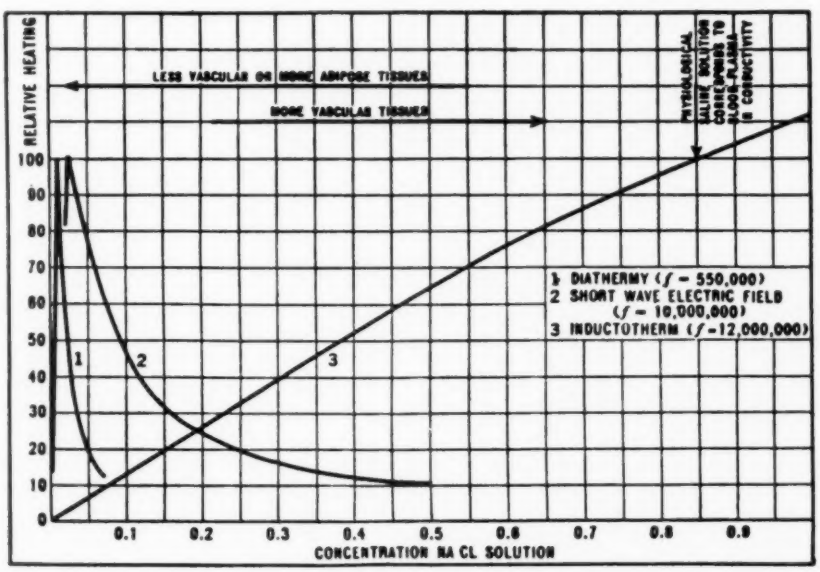
Graph 2 illustrates the percentage of heat concentrated upon electrolytes by diathermy, radiothermy, and electromagnetic induction, while graph 3 clearly demonstrates the difference in temperature between the subcutaneous lymph space and various other internal structures.

From the standpoint of safety, the effect upon the circulation of the different forms of heat must be considered. This is illustrated by graph 4.

The claims of some investigators, therefore, that the agent used in fever production is of no import, cannot be experimentally, physiologically or clinically substantiated.



Graph 1. — Illustrating the difference between skin and internal temperature during fever produced by penetrating and external heat. Note that during external heat the skin temperature remains constantly higher than the internal temperature while with penetrating heat it remains lower. (After Neymann and Osborne.)

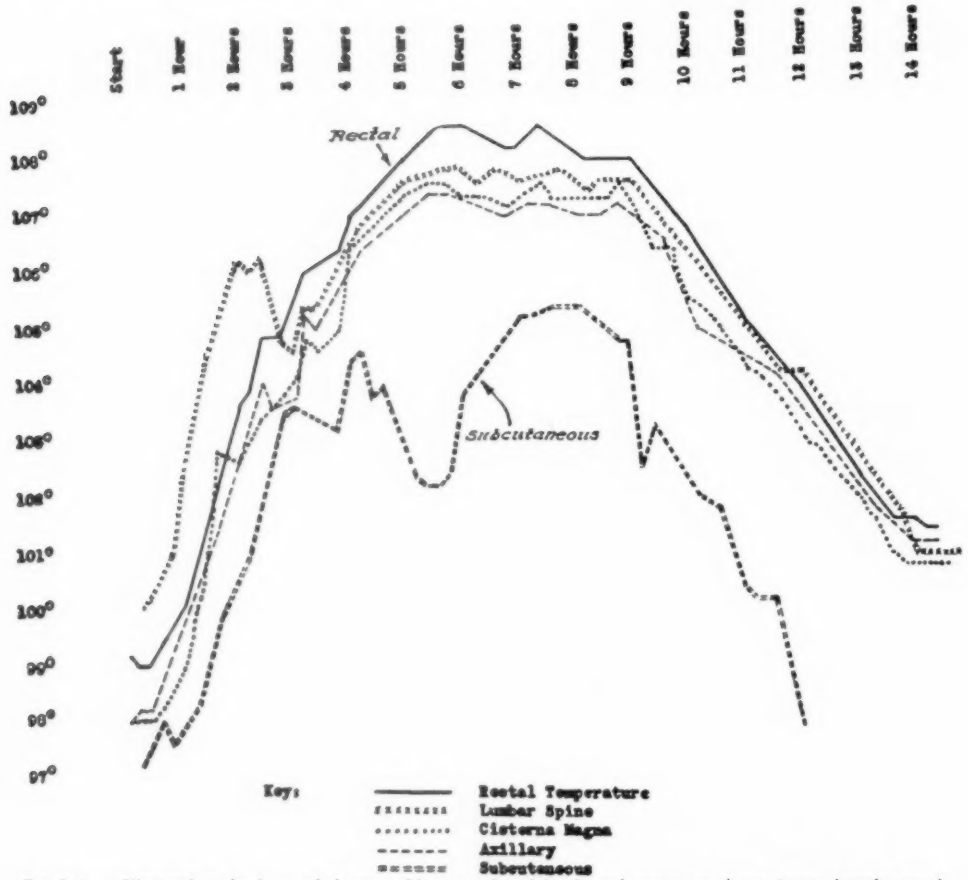

RELATIVE HEATING
LESS VASCULAR OR MORE ADIPOSE TISSUES
MORE VASCULAR TISSUES
PHYSIOLOGICAL SALINE SOLUTION CORresponds TO BLOOD-PLASMA IN CONDUCTIVITY
1 DIATHERMY (f = 550,000)
2 SHORT WAVE ELECTRIC FIELD (f = 10,000,000)
3 INDUCTOTHERM (f = 12,000,000)
CONCENTRATION NA CL SOLUTION

Graph 2. — Showing the comparative heating effect upon electrolytes in different concentrations by diathermy, radiothermy and electromagnetic induction. Note that maximum heating by induction occurs at 0.85 per cent (physiologic) concentration as compared to 0.1 per cent with the other two. (Merriman, J. R.; Holmquest, H. J., and Osborne, S. L.: Am. J. Med. Sci. 187:5 (May) 1934.

Analysis and Methods of Study

During the past six years two hundred and forty patients with cutaneous disorders have been treated by fever induced by electromagnetic induction. The series segregates itself into the following classifications: eczematoid group with or without other allergic manifestations, 75 cases; erythema multi-

forme, 15 cases; psoriasis, 6 cases; endocrinopathies with associated cutaneous manifestations, 30 cases; urticaria, 100 cases; seborrheic dermatitis, 14 cases. Variations in age, sex, duration of the disease, technic, observation and relapse periods, and clinical results are summarized in table 1.

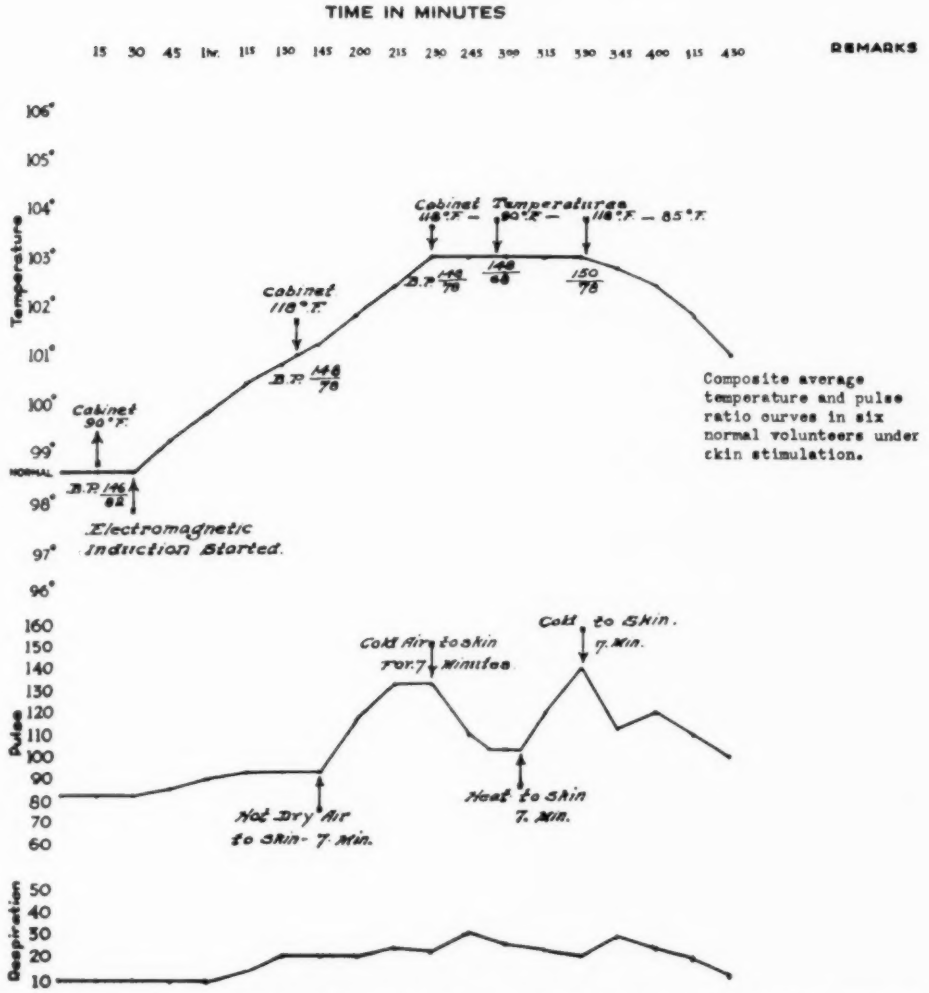


Graph 3. — Illustrating the lowered degree of heat produced in the subcutaneous tissue (great lymph space) during fever produced by penetrating heat (Diathermy). The skin is cool and free to eliminate while the internal temperatures parallel each other. (After Neymann and Osborne.)

For convenience and the value of comparison with a smaller number of cases observed over a shorter period, table 2 is reproduced from a former study.[9]

TABLE 1. — *Results of Fever Therapy by Electromagnetic Induction in 240 Cases Suffering from Cutaneous Disorders.*

Disease	Total Cases	Sex	Age Yrs.	Duration	Temp.	Number Treats.	Observation	% Immed. Response	% Relapse
Eczematoid	75	M.-45 F.-30	3-53	6 mos.-20 yrs.	103-105 F.	6-20	3 mos.-4 yrs.	62- 82⅓	20-26⅔
Multiforme Erythema	15	M.-10 F.- 5	20-45	3-10 yrs.	102-104 F.	6-12	6 mos.-2 yrs.	13- 86⅔	5-33⅓
Psoriasis	6	M.-12 F.- 4	23-38	1 mo.-4 yrs.	101-103 F.	6	6 mos.-4 yrs.	3- 50	2-33⅓
Endocrine	30	M.-10 F.-20	10-23	1-5 yrs.	102-104 F.	6-18	3 mos.-6 yrs.	24- 80	3- 6⅔
Urticaria	100	M.-40 F.-60	8-42	2 wks.-8 yrs.	102-106 F.	6-30	3 mos.-6 yrs.	70- 70	50-50
Seborrheic Dermatitis	14	M.- 8 F.- 6	12-32	15 mo.-3 yrs.	102-104 F.	6-15	1-3 yrs.	11- 78½	2-14⅓



Graph. 4. — Showing direct relationship between pulse rate and skin temperatures. Note the independence between heart rate and the general body temperature.

Many interesting facts are gleaned from these tables. The importance of a sufficient observation period together with the relapse ratio is evident. Insufficient analysis of these two factors would lead to misleading clinical

TABLE 2. — *Illustrating Results of Fever Therapy by Electromagnetic Induction in 167 Cases Suffering from Cutaneous Disorders.*[9]

Disease	Total Cases	Sex	Age Yrs.	Duration	Temp.	Number Treats.	Observation	% Immed. Response	% Relapse
Eczematoid ..	50	M.-30 F.-20	3-52	6 mos.-20 yrs.	103-105 F.	6-20	3 mos.-6 yrs.	48- 96	15-31¼
Multiforme .. Erythema	10	M.- 8 F.- 2	29-45	3-10 yrs.	102-104 F.	6-10	6 mos.-4 yrs.	9- 90	3-33⅓
Psoriasis	6	M.- 2 F.- 4	23-38	1 mo.-4 yrs.	101-103 F.	6	6 mos.-6 yrs.	3- 50	1-16⅔
Endocrine	15	M.- 5 F.-10	10-18	1-5 yrs.	102-104 F.	6-18	4 yrs.	12-80	0-0
Urticaria	80	M.-30 F.-50	14-39	2 wks.-5 yrs.	102-106 F.	6-18	3 mos.-4 yrs.	50- 62½	30-60
Seborrheic .... Dermatitis	6	M.- 3 F.- 3	12-32	15 mo.-1 yr.	102-104 F.	6-10	1 yr.	6-100	1-16⅔

interpretation of results. In the eczematoid group within the first four months a higher 96 per cent immediate response is noted, with a 31¼ per cent relapse. As the group treated increases and the observation period lengthens from four to six years, the immediate response drops to 82⅓ per cent and the relapse to 26⅓ per cent. By similar comparison of the two tables, interesting changes in the other groups will be noted. The main value gathered in increasing the study from four to six years is that the ratio between the immediate response and the relapses remains sufficiently satisfactory to justify continuation of fever therapy in these conditions. Especially is this true since other forms of therapy have been found unsatisfactory.

The endocrine group in this investigation represented patients with multiple cutaneous and systemic syndromes. Eczematoid, pseudo-urticaria, pseudomyxedema and modified ichthyosis are some of the various terms applied to these skin manifestions. An associated polyglandular imbalance, sedentary habits, low metabolism, low blood pressure and poor digestion and elimination are usually present. From the analysis of the tables fever therapy would appear to be very promising in this group. Apparently stimulation of the general metabolism by induced fever enables the deficient endocrine glands more properly to carry on their individual functions.

Biochemical Studies

Rosen, Rosenfeld, and Krasnow[10] have studied the blood with respect to cholesterol, albumins, globulins, lecithin, and lactic acid, in many of these resistant dermatoses. They have found a decrease in free cholesterol ranging from 26 to 49 per cent in 81 per cent of their cases. The other blood elements did not show a definite trend. In the sweat, however, increase in lactic acid excretion and changes in the pH during fever therapy were noted.

During fever induction the study of the sweat by specific crystallization in these cases reveals most interesting information both as to etiology and therapy. The technic is not particularly difficult once it has been worked out, although it will need to be varied according to each type of fever set-up. Figure 2 represents the evaporated sweat from a normal volunteer and shows nothing of special significance. When compared to figure 3, however, which

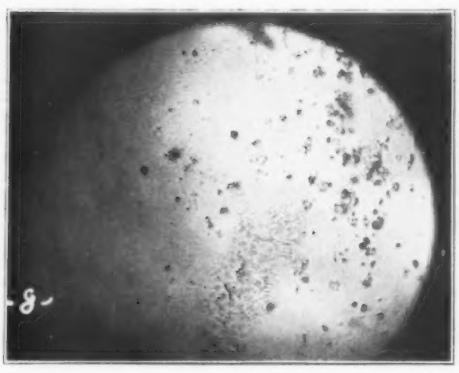


Fig. 2. — Crystals isolated from sweat of normal volunteer. Nothing of special significance shown except occasional spicule and dagger shaped crystals.

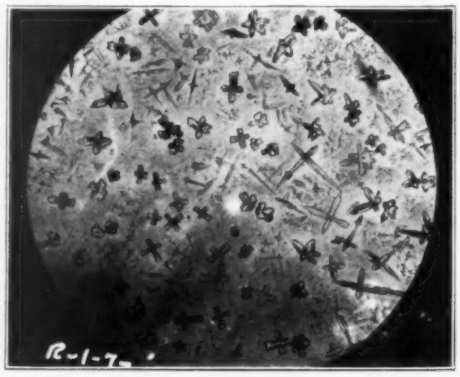
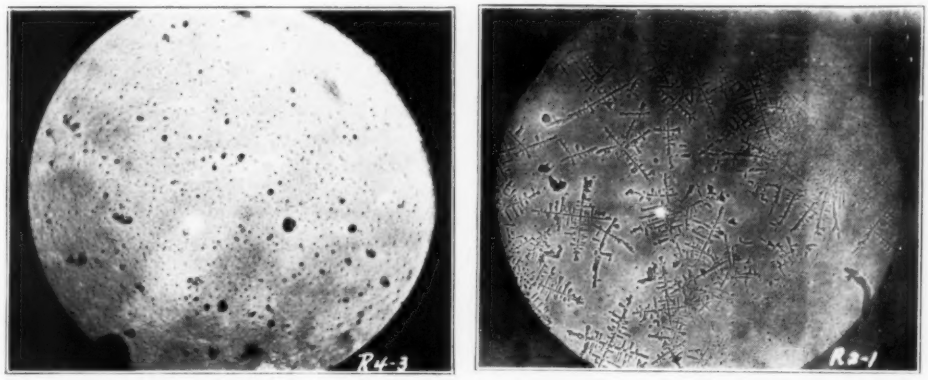


Fig. 3. — Generalized eczema. Crystals isolated from sweat following eight hours rest. Large circumscribed dots are calcium lactophosphate.

is the crystallization of sweat before treatment from a patient with generalized eczema, a difference is at once noted. Long circumscribed dark crystals of calcium lactophosphate are visible.



A B

Fig. 4. — Generalized eczema during and following fever induction: *A*, long bars with spicules attached at right angles are lactoammonium chloride; these crystals are very unstable; note them undergoing change within a few moments after preparation; *B*, dagger and flower petal type of crystals characteristic of urea and sodium chloride in different concentrations.

After fever treatment in the same eczema patient crystallization of the sweat reveals an unusual change, as shown in figure 4 (a) and (b). Long bars with spicules at right angles of lacto-ammonium chloride rapidly undergoing an alteration into dagger and flower petal type of crystals, characteristic of urea and sodium chloride combining in different ratios can be observed. Similar products are isolated in the sweat of erythema multiforme, as revealed in figure 5.

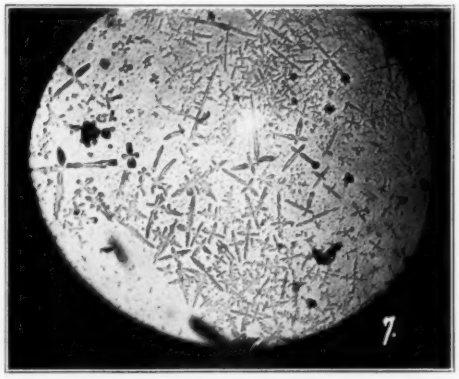


Fig. 5. — Erythema multiforme. Crystals from sweat during fever by electromagnetic induction. Urea and sodium chloride, lactoammonium chloride and calcium lactophosphate are all shown.

Comment

Studies of metabolism, blood, and sweat during fever therapy further strengthen the growing opinion that many of the resistant dermatoses have a common underlying systemic and metabolic background which is often obscure. Endocrine, autonomic and central nervous system imbalance may enter into the etiologic picture.

The impairment of skin function probably through extrinsic and intrinsic factors tends to surcharge the great subcutaneous lymph space with toxic and irritating products. Peripheral spasm can then result with alteration in the lumen of the corkscrew excretory ducts leading to impairment of normal excretory balance.

Fever therapy when produced by penetrating heat accomplishes several beneficial requirements. It supplies heat to the thermogenic center in the brain base, which in turn produces peripheral vasodilatation with relaxation of spasm. Stimulation of general metabolism with all of its associated effects influences all vital functions and tissues. While all this is taking place the normal physiologic temperature gradient between the skin and the internal structures is being maintained. This is not the case when external or baking type of heat is used for fever production.

Investigation of the therapeutic possibilities with physically induced fever in intractable dermatoses, extending over a period of six years, has established that successful results frequently follow the procedure in properly selected cases.

Summary and Conclusions

1. Fever therapy by physical means may be successfully applied to resistant and recurrent types of dermatoses.

2. Induction of fever by penetrating heat is the method of preference.

3. Anatomic and physiologic factors concerned with normal skin function are important considerations in the etiology and therapy of these skin disorders.

4. Biochemical studies of the blood and sweat indicate a common metabolic background in a number of skin diseases.

5. Correction of the underlying metabolic disorder, irrespective of the method by which it is done, frequently proves curative in a number of stubborn skin diseases, when without such regime, results are disappointing.

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Discussion

Dr. J. S. Holbrook (Statesville, N. C.): As physicians, whether we be general practitioner, internist or specialist in any field, we are guardians of the human body and therefore must recognize the responsibility of maintaining the external surface of the body in the best possible state. The skin is the largest organ of the human body and it perhaps has many or even more varied functions than any other organ or system.

The essayists have contributed much to our knowledge of the physiology of the skin, and more particularly to certain phases of its pathologic function. These findings provide some of the most basic information that we need in approaching this daily problem. Such studies not only

help us in the management of skin disorders but provide information which may be utilized in the management of the skin in the presence of other systemic diseases. I often think of how the patient, and occasionally the physician, forgets the care of the skin in the presence of such a disease as pneumonia.

The point made regarding the methods of inducing temperature elevation by the inductotherm in conjunction with the air conditioned cabinet has much merit. This is the procedure we have used for the past two years, and we find it superior to many of the other methods previously employed. Some of its advantages are as follows: (1) it is convenient, (2) patients are more comfortable and can be induced more readily to take repeated treatments, (3) a higher elevation of temperature can be secured with less dangers than with other methods, (4) body functions, particularly of the skin, are more satisfactory during the course of treatment. We have found the use of the continuous rectal thermometer a very great help.

The preparation of patients has become fairly well standardized. The provision of sufficient salts and fluids is of course essential and in most cases sedatives are important. The selection of patients and determining the limits of the treatment in degree and in time should be given careful thought. Electrocardiograms and other cardiac studies have been a routine procedure. There are very few conditions or states in which fever therapy is contraindicated. In the past patients have complained of too much discomfort. There remains this point to be overcome with the application of proper sedatives and analgesics.

Observing the therapeutic effects of fever, whether produced by the body itself or induced artificially, on patients with skin disease and also combined with an apparent systemic disease has led us to the conclusion that many of the obscure and idiopathic skin diseases such as psoriasis may be resulting from some systemic, infectious process or disease, such as undulant fever. In such cases the skin symptoms become gradually worse for weeks or months, during which time systemic symptoms gradually become more marked. Temperature may be present to a slight degree. Then, gradually exacerbation of the fever will occur and after a period of rather high temperature the patient starts improving again and the skin symptoms abate. After a few weeks or months a similar cycle is reproduced. In a few such cases we have observed that the induction of artificial fever would abort the skin as well as the systemic disease. So in conclusion I am merely wondering if herein might not lie the solution for a number of the unfortunate individuals whose skin disorders recur and persist.

HYSTEROSALPINGOGRAPHY A DECIDING FACTOR IN THE MANAGEMENT OF FEMALE PELVIC PATHOLOGY *

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and
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Visualization of the female reproductive system as a means of differential diagnosis is not new. From 1914 to 1925 various substances such as collargol, sodium bromide, thorium citrate, and others were used in an attempt to outline cavities. Pneumoperitoneum was and still is used in an attempt to visualize the contours of abdominal and pelvic organs and tumors. These two procedures have been frequently combined. It was not until the employment of iodized oil that this study reached a point which facilitated the development of hysterosalpingography.

Its importance and technic for differential diagnosis in pelvic pathologic processes was discussed by one of us (L.) in 1936[1] and 1937,[2] when an intimation was given of its possibilities with regard to the determination of the most appropriate form of therapy.

In this communication we shall briefly discuss our technic and the results obtained by various therapeutic procedures as indicated by the diag-

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nostic findings. We should like to emphasize that the technic is very simple, easily controlled, and effective under aseptic precautions.

The choice of opaque media for these examinations merits some consideration. One should select a medium which gives a good shadow, is easily injected at body temperature and sufficiently viscous so far as body fluids are concerned in order to be readily eliminated when the x-ray examination has been completed. By using iodochloral, a peanut oil base, its elimination from the female reproductive system requires approximately 15 minutes and gives quite a satisfactory shadow, both under the fluoroscope and on the x-ray films.

A frequent concomitant of the conditions under consideration is leukorrhea, which may be due to endocervicitis, vaginitis, or an irritative response. In endocervicitis the usefulness of cauterization or conization, particularly in the presence of old lacerations, has been well established. We have found that symptomatic relief is obtained by a hypertonic jelly, technically known as Benet's R 701. We use this preparation almost routinely to afford the patient temporary comfort until the underlying pathologic condition can be corrected.

It is our intention to show a positive means of evaluating the merits of various treatments rather than to inaugurate a new modality, electrode or technic. From a diagnostic point of view a hysterosalpingogram permits one to avoid empiricism in physical therapy in the management of infections of the female pelvis. By this means we are in a position to prove our claim that female pelvic inflammation responds to physical therapeutic measures. Although many investigators attempted this in the past, until now it has been true that there was always a question as to the accuracy of diagnosis with no effective means of measuring improvement.

We have been blindly seeking, by empirical measurement, a reliable agent for the treatment of pelvic inflammation. It is to be regretted that the pioneers in this field were handicapped by not having this easy, safe and accurate procedure at their disposal. We need not philosophize upon the changes which might have occurred, but one can readily foresee the changes in the future resulting from the use of this technic.

It should not be overlooked that clinical recovery precedes the disappearance of pathologic processes. In the cases that heretofore have been regarded as cured, the opinion was based more upon subjective symptoms than upon a knowledge of the pelvic state. We all have had the experience of having such patients return for additional care at a later date because of recrudescence of symptoms. For this reason physical therapy has to some extent come into disrepute, not because of any inherent inadequacy, but because of our inability to measure the degree of improvement resulting from any given treatment.

Therapeutic Measures

In our investigation we have utilized short wave (7 and 16 meters) and long wave diathermy and Elliott treatments. Iontophoresis of various medicaments has been omitted because of the past inability clinically to estimate its merits. Unquestionably, acetyl-beta-methyl-choline chloride has a place in selected cases.

A modified Elliott treatment was given with a Dierker applicator rather than the standard rubber bag. Short wave and conventional diathermy were administered with abdominal plates as indifferent electrodes, rather than a belt, and the intravaginal Chapman electrode. The short wave drum, cable or pad to the abdomen, takes second place to the more direct applications.

Inasmuch as all of our short wave apparatus are equipped with arbitrary meters to gauge the amount of the energy output, it means nothing to say

that the average treatment was given "at twenty." When it was attempted to increase the line power above this point of twenty, a rise in temperature was seldom obtained and much cramping ensued. The readings of a milliammeter placed in line with the patient astonished us by showing that the average arbitrarily determined setting of ten was yielding an output of 1500 milliamperes and at twenty would give quite a variable reading. It was also noted that no direct ratio existed between the output meter on the apparatus, the milliamperage, and the cervical temperature. On two occasions the thermocouple was burned out "at thirty" because of an excess of 3000 milliamperes, while in other cases at thirty the reading was never above 1500 milliamperes.

Our special milliammeter was made by putting a thermocouple in a separate housing, connected directly to the electrode. Connections from the thermocouple to the milliammeter were made by a separate two-wire cable running from the thermocouple back to the apparatus. This arrangement placed the generator in such a position that the ammeter readings were not influenced by any extraneous currents including the high frequency flowing from the electrode to the patient.

The findings thus obtained led us to conclude that heat was being formed within the field of application beyond the body's ability to disseminate it, therefore the cramping. It is strange that none of us would accept a spark gap diathermy apparatus that was not equipped with a milliammeter, yet we continue to use short wave apparatus which are not equipped with a means of determining dosage in the terms of a common electric unit (fig. 1).

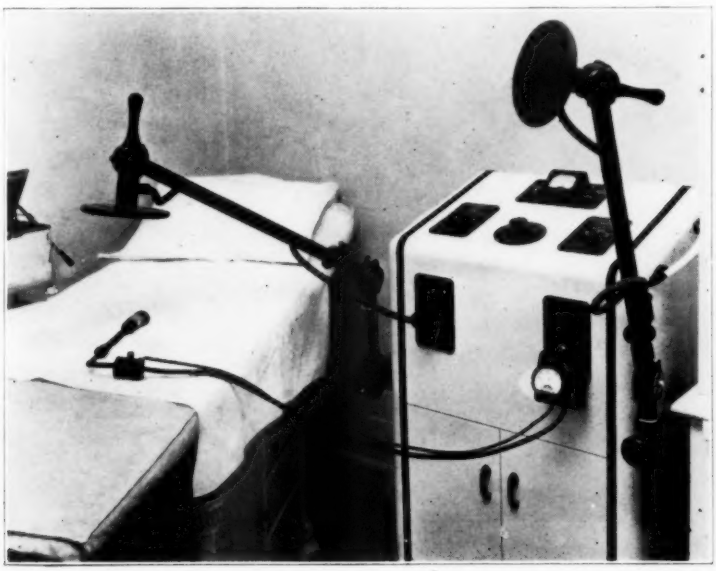

Fig. 1.

The accompanying statistical review of 206 patients treated by physical measures or operation is grouped according to whether the fallopian tubes were closed or open (table 1). The results of the cases considered as cured, improved or unimproved were calculated on a percentage basis. This table shows also average temperatures obtained with the modified Elliott (Dierker), diathermy and short wave treatments, and the average number of treatments given with the various procedures. With a view of demonstrating some of the diagnostic and therapeutic data, which of course do not

appear in the table, we present the following illustrative cases selected at random.

TABLE 1. — *Statistical Report of Cases Treated with Relation to Hysterosalpingography.*

	No. Cases	Cured %	Improved %	Unimp. %	Avg. Temp. °	Avg. No. Tr.	
Elliott	73		Under Treatment				
Open Tubes		51.6	32.3	4.8	114	12.4	
Closed Tubes		47.6	33.3	....	114	24.3	
Spark Gap	76						
Open Tubes		54.3	5.4	.06	106.4	26.7	
Closed Tubes		51.0	4.8	.15	106.4	38.2	
Short Wave	28						
Open Tubes		52.5	15.0	.....	108.5	24.5	
Closed Tubes		49.3	38.9	.90	108.5	46.4	
Operative	29	93.1	6.9				
Operative %							14.3
Total No. Cases	206						

Case Histories

CASE 1. — Mrs. H. L., aged 27, complained of headache, right lower quadrant pain with no gastro-intestinal nor menstrual symptoms. General physical examination negative; pelvic examination reveals tenderness in both fornices with no palpable mass.

Roentgenologist's report of the hysterosalpingogram showed an essentially normal uterus as to position and size but definitely a spasm about the left horn; normal right tube; left tube distorted in position with multiple marked constrictions. This suggested a unilateral lesion characterized by inflammatory response, tube coiling about a more or less spherical mass showing no increased density, with the intestinal gas below the level of the broad ligament on the right and definitely above on the left (fig. 2).

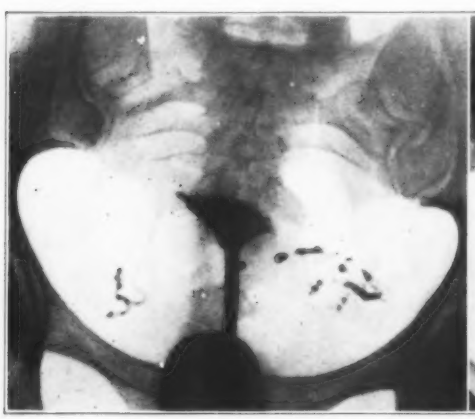

Fig. 2.

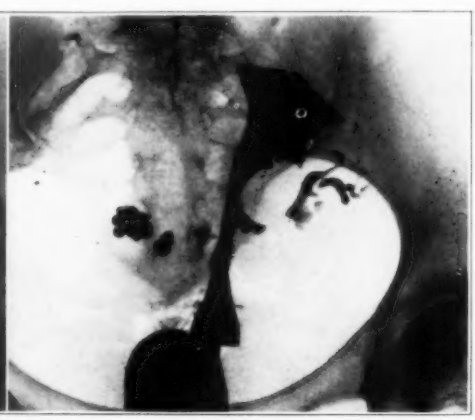

Fig. 3.

Diagnosis: Left ovarian tumor, cystic.

Pathologist's report of specimen removed by operation: simple follicular cyst of ovary.

CASE 2. — Mrs. F., aged 24, chief complaint — sterility with positive physical findings limited to the pelvis. Examination revealed an induration in the cul-de-sac which could not be definitely outlined, and a displacement of the uterus to the left.

Roentgenologist's report of the hysterosalpingogram showed marked displacement of the uterus to the left with a considerable difference in the outline of the two sides of the uterine shadow; the right tube is not visualized, the oil droplets seen probably coming from the patent left tube; left tube is markedly kinked but shows few strictures; there is little evidence of intestine in the lower pelvis, particularly on the right, and a definitely increased density, irregular in outline, not connected with the body of the uterus (fig. 3).

Impression: Solid tumor of the right, probably also of the left ovary.

Pathologist's report following operation: dermoid cyst of both ovaries, the right larger than the left.

CASE 3. — Mrs. A. W., aged 50, suffers from a sense of bearing down and distention. Physical examination was negative except for symmetrical enlargement of the uterus with displacement.

Roentgenologist's report shows: uterus displaced to the left with irregular filling, rotation on its long axis as shown by the position of the two tubes — one definitely under tension, the other displaced upward and backward; there is marked increase in the pelvic density which can be easily outlined and there is no intestinal gas shown within the pelvis (fig. 4).

Impression: Solid tumor of the reproductive system involving the uterus and obliterating the pelvis, probably fibroid.

Pathologist's report following operation: fibromyoma uteri.

CASE 4. — Miss E. D., aged 24, chief complaint — irregular profuse menorrhagia. General physical and pelvic examination essentially negative.

Roentgenologist's report shows markedly anteflexed uterus with an unusually large cavity, possibly due to flaccidity; tubes were visualized, and though the ampullae are rather large, there is no filling defect; the right tube is coiled upon itself and apparently encircles an enlarged ovary; there is increased density on the same side in the region of the ovary and an absence of intestinal gas (fig. 5).

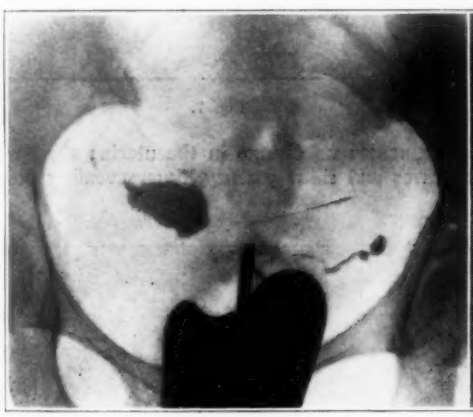

Fig. 4.

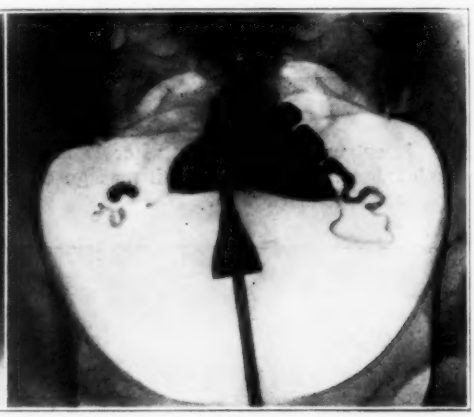

Fig. 5.

Impression: Ovarian tumor, right, probably cystic but possibly solid.

Pathologist's report following operation: ovarian cyst, hemorrhagic.

Following surgical intervention conservative measures were undertaken in the hope of saving the left ovary which was hemorrhagic but in the surgeon's opinion might possibly respond to treatment. The patient considered early marriage.

Short wave intravaginal therapy was administered 3 times per week; 25 treatments and the case has manifested a very decided clinical response.

CASE 5. — Mrs. W. W., aged 25, complained of lower left quadrant and left costovertebral pain; leukorrhea, nervousness, loss of weight. Positive physical finding — left tuboovarian mass.

Treatment: Elliott's, 2 times weekly, 27 treatments of one hour's duration at 120 F. Referred for conventional diathermy because of failure to improve under the Elliott applications.

Roentgenologist's report after the Elliott treatments showed a uterine cavity that fills normally, slightly anteflexed; the right tube fills to the fimbriated end and is somewhat bulbous; only a short portion of the proximal end of the left tube is seen (fig. 6).

Diagnosis: Bilateral chronic salpingoophoritis.

There was a cessation of all clinical symptoms after three pelvic diathermy treatments. The patient was discharged symptom free, confirmed by hysterosalpingogram, after 36 pelvic diathermy treatments (fig. 7).

Roentgenologist's report on completion of the course after diathermy showed uterine cavity filled normally; the opaque medium passed into both tubes, filling the left first, terminal end of which was slightly bulbous, but the opaque material passed through normally; the right tube filled normally, did not have any bulbous end, was normal in size,

and the opaque material passed through its fimbriated end, so that the uterus and tubes became normal.

CASE 6. — Miss M. J., aged 23, complained of leukorrhea. Positive physical findings limited to pelvis which showed tenderness in left fornix with no palpable masses.

Roentgenologist's report showed a normal uterus; both tubes visualized with bulbous ends to the fimbriae and numerous constrictions, particularly in their distal thirds (fig. 8).

Diagnosis: Chronic bilateral salpingoophoritis.

Fig. 6.

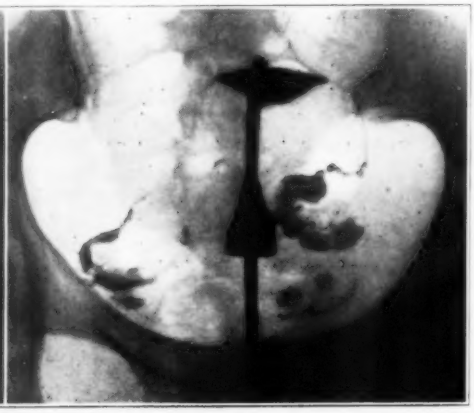

Fig. 7.

Roentgenologist's report after 17 Elliott treatments: no change in the uterine shadow; both tubes fill completely with no sign of strictures and show patency, thus revealing normal conditions (fig. 9).

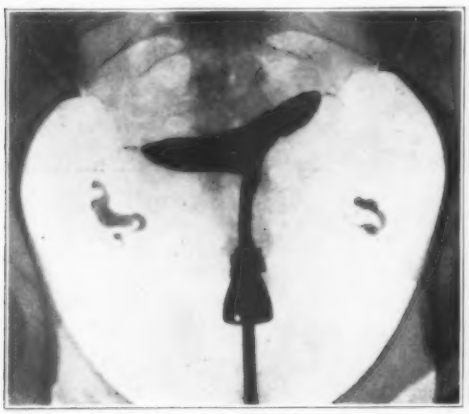

Fig. 8.

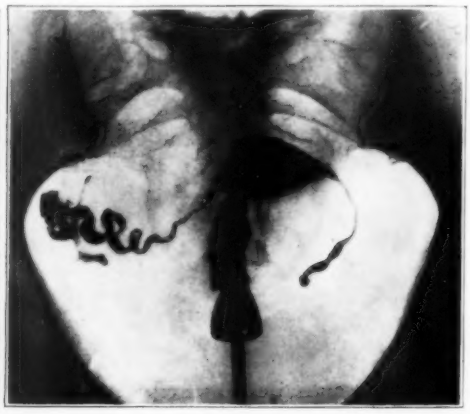

Fig. 9.

CASE 7. — Mrs. H. J., aged 32, gave a history of right lower quadrant pain with cessation of menstruation for two weeks followed by "dribbling." Tentative diagnosis — ectopic pregnancy. Hospitalized for observation. Her history includes previous salpingectomy, side unknown. Laboratory study negative, including Friedman test.

Roentgenologist's report shows: a normal uterine shadow; left tube occluded at its middle third suggesting complete obstruction; the right tube is very tortuous and filled with strictures, fimbriated end is bulbous and occluded (fig. 10).

Diagnosis: Chronic salpingitis, right.

Short wave diathermy, 15 meter, was administered 3 times weekly by a Chapman electrode. After one week the patient was symptom-free and was dismissed after the check hysterosalpingogram, taken two months after inauguration of treatment. It is interesting to note that with the improvement there was a coincident increase in the libido to such an extent as to have averted a divorce.

Roentgenologist's report showed: the uterus and left tube the same as on the previous examination; the right tube fills normally with no sign of stricture and is patent (fig. 11).

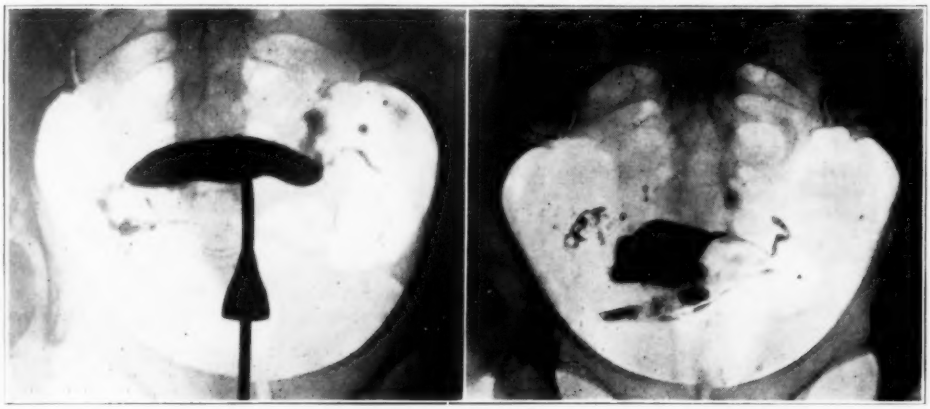

Fig. 10. Fig. 11.

Conclusions

1. Hysterosalpingography provides a means by which one may select cases amenable to physical therapy and direct subsequent treatment.

2. Pathologic conditions which include encapsulated purulent material respond to properly instituted and controlled conservative measures. This response will not be as rapid as with surgical intervention, but preserves the genital organs.

3. Non-encapsulated inflammatory conditions respond to conservative therapy with end results better than those achieved by surgical procedures.

4. Hysterosalpingography yields information that certain types of tumors respond to physical therapeutic measures. To date, too few tumors have been subjected to this management to warrant a conclusion. The orthodox treatment is, therefore, the procedure of choice, at least for the time being.

5. We have constructed a simple meter to register actual milliamperage, delivered to the patient at the electrode in orificial treatments. This gives us an accurate measurement by which we may control subsequent treatments, or study various apparatus and equipment.

6. In our series of unselected gynecologic cases, we have found that 85.7 per cent will respond to non-operative therapy and that the remainder definitely requires surgical intervention. The cases treated by non-operative means show a relatively high percentage of cures as compared with those showing no improvement, which latter averages 1.5 per cent.

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NOTE. — We wish to express our sincere appreciation for the aid in this work given us by the "Fund for Research Gynecology" maintained by J. T. Lloyd and W. C. Sumner. — AUTHORS.

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Discussion

Dr. Mortimer N. Hyams (New York): The essayists' presentation is indeed timely and interesting, and in the main, I am in accord with their ideas.

While uterosalpingography is now new, there have been changes in technic which are of material advantage. One of these is the fractional method, by which a series of 2 c.c. each of the contrast solution is injected until a total of 10 c.c. is given, and x-ray exposure made after each injection. In this way, successive graphic delineations are obtained of pathologic processes

of the uterine cavity as well as of the tubes which might probably be obscured by the dense shadow cast by a single large injection.

I am pleased to hear that long wave diathermy is again receiving consideration and the speakers deserve much credit for making this statement, for it takes courage to admit that one is still using it. Short wave has been exploited to such a degree during the past few years, that it has entirely supplanted other types of diathermy. In my experience, inflammatory pelvic conditions respond satisfactorily to long wave diathermy, particularly when supplemented by the use of specific proteins.

The advantages of uterosalpingography really need little discussion. There are still some who feel it is a hazardous procedure and may be followed by tubal complications. However, in selected cases, there is no danger, and sometimes, this is the only method by which a correct diagnosis may be obtained. I have with me several x-rays of gynecologic conditions illustrative of this. The first is that of a young woman who was referred for sterility. A test by insufflation proved the tubes to be patent. On physical examination, there was nothing to account for the condition. Her husband was likewise examined and no abnormality found. The cause was not discovered until a uterosalpingogram revealed a congenital elongation of the fallopian tubes, the fimbriae of which extended to the crest of the ilium. Due to the abnormal length, pregnancy was practically impossible. Another interesting condition, bicornuate uterus, is likewise only demonstrated by this procedure.

In conclusion, may I be permitted to ask this question. In how many cases of salpingitis treated by diathermy has pregnancy been effected? We have found that some patients thus treated did not conceive, although the tubes became patent. Others must be watched for recurrence of salpingitis or for ectopic gestation.

Dr. B. Billman (Cincinnati): May I emphasize by repetition a point in this paper which I consider of major importance to medicine. It is, as has been pointed out, that there is a difference between the time at which a patient is clinically well and that at which she is free from pelvic inflammation.

To illustrate, one of the cases in the group reported in the paper was a patient who completely recovered clinically within two weeks of the time treatment was instituted, but as demonstrated by hysterosalpingography, required two months of treatment before the x-rays were negative. I use this case to emphasize a fact which we all recognize, that for many years we have been able to measure the effectiveness of the treatment of pelvic inflammation only by signs and symptoms, and have been faced with frequent recurrences in presumably cured patients. We now have not only a means of accurate diagnoses, but a technic for mensuration of progress.

Dr. Hyams has brought up the question of non-specific protein therapy. There is no question of its value in certain instances. Now that we have a proved method of determining the efficacy of treatment, we are instituting three series of cases: (1) where physical therapy alone is used, (2) where non-specific protein therapy alone is used, and (3) where the two are combined. I trust that at our next meeting I will be able to report on our findings.

Dr. George Lyford (closing): Dr. Hyams brings up several points well worth consideration. The fractional instillation procedure is unquestionably a vast improvement over the usual technic. We did not emphasize this point since in previous publications we have shown why the controlled apparatus is superior to even fractional instillation. A relatively small amount of oil is used, on the average less than one and one-half c.c., which, being injected slowly under controlled pressure and fluoroscopic examination, allows the operator to obtain films as they may be indicated.

The danger of the procedure I feel has been over emphasized. As I have previously pointed out, the danger lies with the man using it and his technic, rather than with the procedure itself. The method we use is under the absolute control of the physician with the safety factors automatically operating. That there have been tubal ruptures, torn adhesions, pelvic abscesses, peritonitis, and the like, resulting from hysterosalpingography cannot be denied, but close scrutiny has shown that they occurred during the infancy of this method of study. With our present knowledge and equipment these should not take place. On our last analysis of over 8,000 cases, we find no such complications. Hysterosalpingography properly administered can be an office procedure with the patients continuing their usual activities with little, if any, discomfort.

Dr. Hyams mentions the occurrence of ectopic pregnancies following this procedure. We have had occasion to look up the statistics on this point and find that the percentage of extra-uterine pregnancies following hysterosalpingography is about one-half of that reported before this procedure was used. To discuss the question of the percentage of successful sterility cases where hysterosalpingography or insufflation, or both, have been used in the diagnosis or treatment, would require a paper itself. Our clinic has so far had an 88 per cent success, which means little since economic and social, as well as medical, factors are involved and the percentage of successes fluctuates accordingly in different clinics and localities.

RADIUM AND X-RAY IN TREATMENT OF CANCER OF HEAD AND NECK

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What are the indications for radium and x-ray in the treatment of neoplastic diseases? Are the advantages of radiation therapy to be found in the physical properties and adaptability of the radiation or are they due to the inherent characteristics of the various malignant growths? During the past few years the "selective" action of radium and x-ray has been shown for certain kinds of cancer. The growths suitable for radiation therapy must possess some degree of sensitivity to these agents. Obviously, the growth must be more sensitive to radiation than the normal tissues which contain it, otherwise radium and x-ray can offer no advantages over any destructive, non-selective cautery. Failure to consider this premise has led to the injudicious use of these agents, with consequent loss of confidence in their effectiveness.

Decision for the application of radium or x-ray, or both, to a growth depends primarily upon the likelihood of complete destruction. This biologic property of potential destruction has become known by the term radiation-sensitivity. During the early days when low voltage x-ray apparatus were used with little or no filter, and radium was employed without filter, the response was effective for superficial growths and, therefore, all of these types were believed to be radiation-sensitive while the more deep-seated tumors were then considered to be radiation-resistant. The increase in voltage and filtration has greatly added to the group of responsive neoplasms because effective radiation now reaches the deep-seated tumors, and has correspondingly diminished the number of growths considered to be radiation-resistant. Our present experience and judgment have enabled us to irradiate tumors in various locations of the body with an idea of delivering a specific dose into the growth itself rather than the amounts of radiation delivered to the skin. Furthermore, experimentation and analysis have now made it possible to prescribe a lethal dose of radiation with some degree of accuracy. This "cancerocidal dose" may be delivered by radiation from an external source or by the insertion of radium in its various forms into or around the growth itself, or by a combination of both.

Radiations in the x-ray and radium range, although of the same family as ultraviolet, infra-red, and short wave diathermy, have an entirely different effect and mode of action due to their greater energy. Radium and x-ray radiations act directly on the atomic cell structure by penetrating the tissues and actually releasing individual packets of "shrapnel" for direct lethal action on cell nuclei and other vulnerable structures. On the other hand, the longer wavelengths (diathermy) may be said to owe their efficacy to inducing changes in the environment and physiologic function of cells and tissues.

Program of Treatment

In order that a program of treatment may be planned, it is first necessary to determine the type of growth in each case. This involves the question of whether it is a highly radiation-sensitive variety which may be destroyed rapidly, or whether it is a more resistant type in which destruction

takes place by progressive radiation fibrosis. This decision is made primarily on the basis of the histologic nature of the neoplastic tissue, although many other factors relative to the tumor as well as the individual patient must be considered. Biopsy and pathologic study of the tissue, however, remain the most valuable sources of information. Stewart[1] has aptly summarized the pathologic study of biopsy material with relation to response to radiation by saying, "In the case of many individual tumors, the fundamental nature of the tissue of origin outweighs all other considerations when an attempt is made to estimate the sensitivity." For example, the primitive blood-forming structures predetermine the radiation-sensitivity of tumors developing from lymphoid, myeloid, and vascular structures, such as lymphosarcoma, myeloma, endothelioma, and angioma. Stewart defines the term radiation-sensitivity to be "the condition in the growth and in the individual which permits marked or total tumor regression under doses of radiation sufficiently small to preserve the integrity of the surrounding tissues."

Radiation-sensitivity and radiation-curability are not synonymous terms. Permanent regression of a local tumor may be achieved by one or more methods of irradiation without necessarily checking the disease as a whole.

The methods of applying radiation have been greatly improved during the past fifteen years. The present day procedures may be summarized briefly as follows: (a) External radium — massive dose —, (b) external x-ray, and peroral — massive dose —, (c) external x-ray — protracted, fractionated dose —, (d) combined x-ray and interstitial radium, (e) radiation and surgery.

The relative accessibility of the growth compared to the adjacent normal structures partly determines the extent to which one must resort to surgery. All gradations are possible ranging from conservative surgery, where primary reliance is given the radiation, to radical operation, where the radiation is used as an adjunct. This combination of methods is becoming of great value with the increasing accuracy and efficiency of both the radiation and the surgical procedures.

The case histories presented below illustrate these various basic methods of treatment.

Treatment by External Radium or X-Ray (Massive Dose)

The surface application of radium over a growth is the simplest form of radiation, and is usually planned for a single massive dose. Calculations for the treatment are based upon the three dimensions of the growth, the type and grade according to the microscopic examination of biopsy material, and the invasion and structure of the adjacent tissues. The procedure must be planned both to protect the surrounding structures and to deliver an adequate dose to the growth.

Factors pertaining to the radium applicator are size, filtration, and distance. A plaque is selected the size of the growth, or slightly larger, which may be square, rectangular, or round. Gamma radiation only is used, the alpha and beta rays being eliminated by the use of 2.0 mm. of brass filtration or its equivalent. Distance between the growth and radium is equally important since the depth dose is primarily controlled in this way. Due to the geometric decrease in intensity with distance, there is only one-fourth the dose if the distance is doubled. This phenomenon controls the extent of the radiation effect at a depth because, in general, at twice the source-to-skin distance there will be 25 per cent of the skin dose, or, in other words, at a distance below the skin equal to the distance of the applicator above the skin, there will be 25 per cent of the skin dose. Hence, by increasing the source-to-skin distance at which depth there will be 25 per cent skin dose, the latter will be increased. Other factors, such as the area of the

applicator, modify these actual values, but the governing principle remains the same.

Low voltage x-ray may be used interchangeably with radium in many locations. Soft radiation is given at as short a distance as possible; by physical and geometric principles these factors tend to limit the effects to the superficial structures. Decrease of the distance factor has been carried to the extreme in Chaoul's[2] method or contact therapy.

Case 1. — S. M., male, aged 67, teamster. Two years before the patient came to me the surface of the lip became thickened and roughened. Fissures appeared which did not heal, and the process hardened the lip. Eighteen years previously the lips and face were severely burned by hot tar. Healing was rapid without complications, but the lips had remained quite sensitive. Pipe smoking had always been a habit until recently, when the irritation became too severe for pleasure.

On examination, the entire lower lip was found to be covered by an irregular, keratotic and fissured growth (fig. 1). The contour of the lip was not altered, and there

Fig. 1 — Extensive squamous carcinoma involving the entire lower lip of two years duration (case 1).

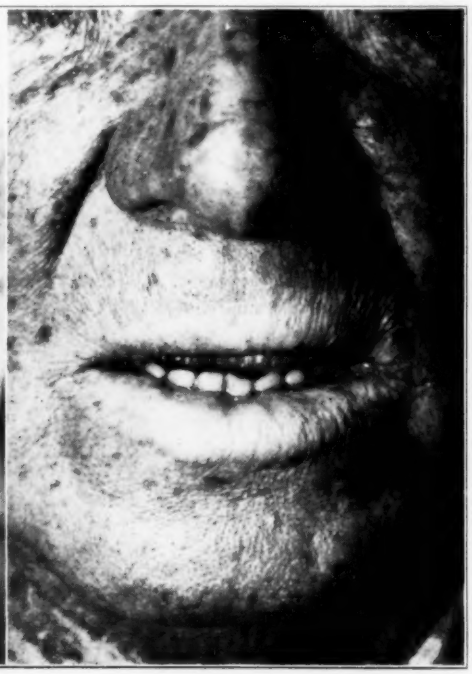

Fig. 2. — Photograph over five years after radium treatment showing no deformity or scar tissue (case 1).

was no evidence suggesting deep invasion. The left commissure of the lips was involved, and it covered the anterior third of the mucosa of the left cheek. Third degree leukoplakia surrounded the mucous margins of the growth. The lymph nodes in the neck were not involved clinically.

The pathologic report of biopsy material showed a squamous carcinoma, grade 1.

In April, 1934, a plaque (1.5 by 1.0 cms.) containing 28 milligrams in 14 needles of 2.0 milligrams of radium each was applied on the surface of each half of the lower lip by means of a 2.0 mm. U-shaped lead mold. The filtration was 0.3 mm. steel and 2.0 mm. brass. A dosage of 300 milligram hours was given by holding the plaque against the cheek with the same U-shaped lead appliance.

Over five years later the mucous membrane appears normal and free from scar tissue. Metastases have not appeared (fig. 2).

Divided X-Ray Therapy Dosage

X-ray therapy may be applied in a variety of ways, but the divided treatment has proved most successful. Daily suberythema doses may be given over a sufficient period permanently to destroy a high percentage of

superficial and deep-seated growths. In the first place the daily amount of radiation must be greater than the recuperative power of the cancer can overcome, and secondly, it must be continued sufficiently long so that the accumulated effect is cancerocidal. Finally, the treatment must not only be planned for the regression of the cancer, but the dose, naturally, must not be sufficient to destroy the normal surrounding structures. If the growth is more sensitive to radiation than adjacent normal tissues, success with the primary growth is frequently assured.

An ideal area in the body for this divided technic is the pharynx and extrinsic larynx where Coutard[3] originally applied this form of treatment. Not only does the anatomic situation permit an ideal portal of entry, but the types of neoplasms in the throat are highly radiation-sensitive. In this way daily treatments may be given on fifteen to thirty successive days, and success may be attained in 30 to 40 per cent of the patients in an unselected group.

The same principles are applied to other areas in various modifications. Intraoral growths may be treated by x-ray therapy through peroral cones (case 2). The radiation is given directly on the growth rather than through the tissues of the cheek or neck.

CASE 2. — W. H., male, aged 84, carpenter. Eight months before the patient came to me he first noticed a sore on the gum, which he attributed to ill-fitting plates which had been worn for twenty years. The past few years the plates had caused irritation, and it was impossible to wear them for the past three months. Recently pains were frequent in the jaws, and at times they radiated up the side of the head.

On examination, the left lower alveolar ridge was found to be replaced by a crater-like, ulcerated growth 3.5 cm. long (fig. 3). The gum was destroyed from the alveolus of the lateral incision posteriorly. The growth extended down each side of the horizontal ramus of the mandible and invaded the tissues in the floor of the mouth and buccogingival groove. Lymph nodes were not palpable in the neck.

Radiographs of the mandible showed an area of destruction 3.5 by 2.0 by 2.2 cm. in the alveolar ridge. The defect in the bone coincided quite accurately with the size and extent of the visible lesion in the soft tissues.

The pathologic report of biopsy material showed squamous carcinoma, grade 1.

From April 1 to May 11, 1938, on alternate days 400 roentgens were given through a 10.0 cm. cone over the mandible alternately with 200 through a 4.0 cm. peroral cone (fig. 4). A total dose of 4000 r. was given through the cheek and 1800 r. directly on the growth. The factors for this radiation were 200 K.V., 15 ma., Thoraeus filter equivalent to 2.0 mm. copper, and at 50 cm. distance for the external portal and 25 cm. for the peroral portal. Dosages quoted were measured *in air* (without backscatter).

A metastatic node in the right neck was found in April, 1939. Preliminary x-ray therapy was given and followed immediately by surgical exposure of the mass and implantation of radium needles into it. The area healed and there has been no evidence of recurrence or extension elsewhere in the neck.

The x-ray reaction was intense for four weeks and numerous spicules of bone were removed from the ulceration. Healing quickly followed, and the scar now is normal and withstands a new denture without discomfort (fig. 5). Radiographs of the mandible taken recently show normal bone texture around the defect caused by growth.

Combined Treatment by X-Ray and Interstitial Radium

X-ray therapy and interstitial radium or radon seeds may be satisfactorily combined for deep-seated growths or deeply infiltrating surface cancer. For this combined method a procedure is formulated which will deliver a lethal dose to the cancer with a minimum amount of radiation changes in the surrounding tissues. For example, in the treatment of cancer of the tongue interstitial radiation may be employed alone for the early growths, while advanced growths (case 3) often require too much radiation, if all delivered in one form, to assure prompt healing with a pliable non-tender scar.

The lethal dose for epidermoid cancer was determined by the experimental work of Martin, Quimby and Pack,[4] the amount required being based

Fig. 3. — Extensive destructive cancer involving the left lower gum with bone invasion (case 2).

Fig. 4. — Method of delivering high voltage x-ray therapy into a cavity and in this instance by the peroral route (case 2).

upon both the dimensions and radiation-sensitivity of the growth. Frequently one-third to one-half of the required radiation may be given by x-ray. The remainder is supplied by interstitial radiation in the form of radium needles or radon seeds inserted directly into the growth.

Fig. 5. — Photograph of case 2 after x-ray therapy through an external and a peroral portal.

In the case of combined radiation methods it is necessary to determine the actual tumor dose delivered by each method, since the two would not otherwise be capable of comparison. The tumor dose for x-ray therapy may be accurately calculated when the half value layer of the radiation, the depth of the growth below the surface portal or portals, the character of the tissues penetrated, and the duration or number of days for the treatment are known. The interstitial radiation should follow immediately. Selection of the form for this supplemental radiation depends upon the radiation-sensitivity of the growth, the amount and quality of preliminary x-ray therapy, the accessibility, the character of adjacent tissues, and the application of protective devices. For example, a cancer of the tongue may be given

radium needles or radon seeds, but protection of the mandible and gum is essential for the best cosmetic result. In this instance it may be well to implant radium needles for a short period and keep a mold in place to protect the bone (case 3). A growth on the soft palate, base of the tongue, or pharynx requires radon seeds because of the inaccessibility for radium needles (case 4). In cancer of the antrum, a radium capsule placed equidistant from the walls is more advantageous than either needles or seeds (case 5). This type of applicator is desirable for all growths involving cavities.

The combined procedure is the most flexible, and for this reason is employed for the majority of cancers of the head and neck.

CASE 3. — W. S. R., male, aged 58, executive. In 1934 a whitish plaque was noticed along the left border of the tongue. The lesion gradually enlarged and became whiter until May, 1936, when an ulcer formed in the area. Biopsy showed only leukoplakia. The wound healed after several x-ray treatments, but the leukoplakia did not disappear. In June, 1937, the patient first noticed pain in the tongue, and it steadily increased to such an extent that it interfered with swallowing. The pain was localized and did not radiate. The patient smoked one to two packages of cigaretes daily, and he was a chronic consumer of alcoholic beverages.

On examination, there was found to be a raised, ulcerated growth on the left posterior border of the tongue which measured 3.5 by 3.0 by 2.0 cms. (fig. 6). The margins of the

Fig. 6. — Bulky cancer of tongue with extensive invasion that was treated by irradiation alone (case 3).

Fig. 7. — Photograph of the tongue after treatment by external and interstitial radiation showing no evidence of disease or deformity (case 3).

growth were indurated, and the muscularis was involved deeply. The floor of the mouth was involved slightly, but there was no extension into the base of the tongue or anterior tonsillar pillar. Leukoplakia surrounded the growth and covered the dorsum of the tongue and cheeks in a milder form. Movement of the tongue was impaired. Lymph nodes were not palpable in the neck.

The pathologic report of biopsy material showed a squamous carcinoma, grade 2.

In September, 1937, preliminary x-ray therapy was given. From September 2 to 9, 2000 r were given through a 10.0 cm. cone over the upper left neck, and 1200 r through a 5.0 cm. peroral cone. The factors for this radiation were 200 K.V., 15 ma., Thoraeus filter equivalent to 2.0 mm. copper, and at 50 cm. distance for the cervical portal and 25 cm. for the peroral portal. Dosages were measured *in air* (without backscatter). On September 21, 11 needles containing 2.0 mg. radium with 0.5 mm. platinum filter were sutured

around the periphery of the growth. A mold was made of dental modeling compound which the patient wore throughout the period of the interstitial radiation as a protective device against radiation to the surrounding normal structures. A total dosage of 1400 mg. hours was given.

The local radiation reaction was acute and persisted for six weeks. The area now, three years later, is covered by a normal non-tender scar, and the patient is in good condition without evidence of recurrence or metastases (fig. 7).

Case 4. — J. MacD., male, aged 68, engineer. Eight months before he came to me, he first experienced a fullness in the throat. Difficulty with swallowing was noticed soon, and the past few weeks swallowing had caused pain in the throat which radiated to the ear and left side of the head. Upper teeth had been out for ten years and the same denture had been worn. Recently the denture had not fit well, and the past few weeks he had been unable to keep it in place.

On examination, a tumor was found to have replaced the entire left soft palate, bulging into the oral cavity as well as the pharynx (fig. 8). The surface was smooth, not lobulated, and measured 5.0 by 4.0 by 4.0 cms. All surrounding tissues were invaded, including the uvula and tonsil, and it was adherent to the hard palate and the ascending ramus of the jaw. The posterior nasal space and left naris were clear. Lymph nodes were not palpable in the neck.

The pathologic report of biopsy material showed adenocarcinoma, grade 2.

In July, 1934, 2000 r. were given during a fourteen day period through a 10.0 cm. cone. The factors were 200 K.V., 15 ma., 0.5 mm. copper filtration, and 50 cm. distance. In August the growth had regressed one-third, and eight seeds containing a total of 12.0 mc. were implanted uniformly throughout the growth for a dosage of 1600 mc. hours.

The patient remained well and without evidence of local recurrence or metastases elsewhere for five years, when he died of intercurrent disease (fig. 9).

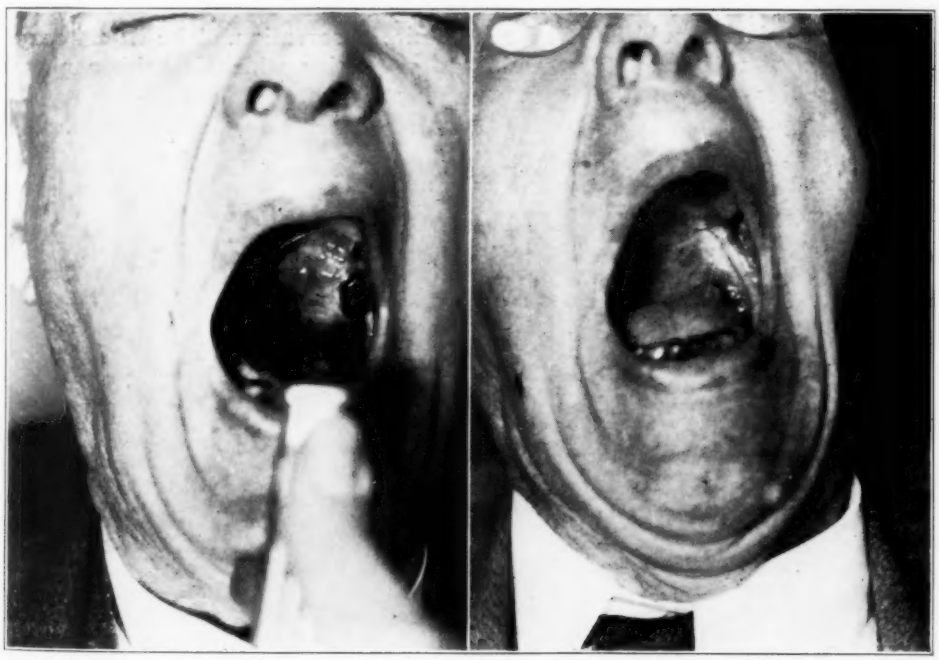

Fig. 8. — Cancer of soft palate with direct invasion of all surrounding structures (case 4).

Fig. 9. — Photograph after treatment of a bulky cancer of soft palate by external and interstitial radiation (case 4).

Radiation and Surgery

Irradiation may fail to control cancer of the head and neck because of the omission of certain aids, chief of which are various conservative surgical procedures. Many tumors have been shown to require both external and interstitial radiation for a cure. In such cases, surgical measures are indicated for exposure, drainage, and dealing with complications in adjacent

bony structures. Removal of the bulky, raised portion of a skin tumor, for example, may make possible more effective radiation of the active base, while exposure of deep-seated growths is an aid to accurate implantation of radium needles or radon seeds, as in early tumors of the nasal accessory sinuses.

The treatment of carcinoma in the sinuses requires adequate surgical exposure and drainage in conjunction with devitalization of the growth by radiation. Many factors must be considered: anatomic relations, close proximity to bone, histologic structure of the tumor, point of origin, degree of infiltration, and presence or absence of infection. A program of attack, therefore, is necessary to meet all phases of new growths in this region.

Preliminary x-ray therapy is now given effectively through two or more portals to temporarily, at least, affect the growth so that surgical exposure or direct implantation of radium may be performed without risk of dissemination.[5] The quality of the radiation from a 200 K.V. equipment is suitable for this type of therapy by properly choosing the variable factors, as in case 5.

Surgical exposure is desirable immediately after the x-ray therapy to permit drainage, avoid undue infection, and offer direct inspection of the growth. The one procedure most commonly used for this purpose is resection of a part of the alveolar ridge and the floor of the antrum. When the bulk of the tumor tissue is removed, radium may be placed in the packing equidistant from all of the walls. The radiation dosage is then calculated, depending upon previous external radiation and the dimensions of the cavity (case 5). Healing takes place in from three to six months, and the defect in the hard palate should be left for indefinite observation. The defect may easily be filled with a denture carrying a projection which is held in place by the remains of the antral floor. Such an obturator on a dental plate is, practically speaking, water tight, and as a rule phonation is not altered.

CASE 5. — Male, aged 55, florist. Eight months before the patient came to me, a sore developed on the gum, which had been cauterized by an exodontist. This ulcer enlarged rapidly, but otherwise caused no symptoms.

On examination, the right posterior alveolar ridge was found to be destroyed by an ulcerating growth 3.0 cm. in diameter. The growth extended into the hard palate for at least 3.0 cm. The soft palate and the bucco-gingival groove were invaded slightly. Radiographs showed extensive destruction of the alveolar ridge and hard palate, and the right antrum was nearly filled with tumor tissue. Lymph nodes were not palpable in the neck.

The pathologic report of biopsy material showed squamous carcinoma, grade 2.

In November, 1935, 2000 r (*in air*) of radiation were delivered over the anterior portal in eight days. A 6.0 cm. cone was used with the following factors: 200 K.V., 15 ma., Thoraeus filter equivalent to 2.0 mm. of copper, and at a 50 cm. distance. Two days later the diseased area, including the alveolar ridge, hard palate, and lower walls of the antrum, was removed to permit free drainage and facilitate radium therapy. A radium capsule containing 50.0 mg. with a 0.5 mm. platinum filter was placed in the packing for a dose of 1800 mg. hours. One month later the disease was still present posteriorly in the pterygomaxillary fossa, and 17.0 mc. of radon in gold seeds were implanted in the area for a dosage of 2200 mc. hours. The reaction was acute for six weeks and healed slowly after sequestration of the bone.

The patient remained well and free of disease until one year later, or in January, 1937, when a metastatic node appeared in the left neck. Preliminary x-ray therapy of 3000 r (*in air*) was given in fourteen days with the same factors. Under novocaine anesthesia the mass was exposed and a number of 2.0 mg. radium needles with 0.5 mm. platinum were implanted around the mass for a dosage of 3600 mg. hours.

On the last examination four years later, the patient was in good condition with no evidence of disease in the jaw or metastases elsewhere in the body (fig. 10).

Similarly, a justifiable substitute for radical neck dissection in metastatic carcinoma of the neck consists in exposure and implantation of radium. This procedure was applied to inoperable cervical metastases as far back as 1916 at Memorial Hospital. Quick[6] later described the indications and details of the procedure. Preliminary x-ray therapy is given to metastatic nodes in

Fig. 10. — Photograph of the defect in the maxilla over four years later after radiation and surgery for a cancer of the antrum (case 5).

divided daily doses of sufficient strength adequately to control them for a period of three months if necessary. These treatments are given simultaneously with the care of the primary growth, and the latter should be well under control before proceeding with management of metastatic disease. External radiation may be given with 200 K.V., equipment, using appropriate factors.

The surgical procedure is concerned merely with the exposure of the metastatic node with only sufficient dissection to determine the periphery and whether the adjacent node is involved. A minimum dissection is desirable to avoid trauma to the diseased area and to maintain the normal blood supply for interstitial radiation.

A direct exposure permits aspiration of the node for diagnosis after the method of Martin and Ellis.[7] Immediate substantiation of the clinical diagnosis is thereby possible with the least risk. In case the node is large and broken down centrally, the mass may be opened and a biopsy made from the exposed surface to permit free drainage. The tumor is measured and a tissue dosage is calculated for a mass of such diameter. With a knowledge of the tissue dosage delivered by external radiation, the difference required to furnish a total dose of 8 to 10 erythema doses is made up by implanting radon seeds or radium needles in and immediately around the node.

The wound is carefully closed to approximate the platysma and skin for primary healing. No difficulty is experienced with healing of the wound from the standpoint of radiation if the implantation is performed within a day or two after the external radiation is completed. In this way, primary healing is obtained before the maximum skin reaction has developed.

Except for metastatic involvements from cancer of the lip, external and interstitial radiation is equally as effective as radical surgery for the control of cervical metastases from cancers of the sinuses, mouth, and nasopharynx.

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AWARDS OF MERIT BY THE AMERICAN CONGRESS OF PHYSICAL THERAPY FOR THE YEAR 1940

For some years the American Congress of Physical Therapy has bestowed upon men who have rendered outstanding services to Physical Medicine its highest expression of recognition in the form of a gold key of merit. It has been the duty of a carefully selected Committee on Awards to select only such men throughout the world, who have made most valuable contributions to physical medicine and allied sciences, not only for the purpose of rendering honor to whom honor is due, but also to serve as a stimulus for others, especially younger workers to undertake original research in any of the manifold subjects furthered by the Congress.

For this the nineteenth annual session the Committee begs to announce that the seven recipients have been chosen after due and deliberate consideration for this signal honor. Their names and citations are:

George Washington Crile, distinguished son of Ohio; founder and present director of the Cleveland Clinic Foundation; holder of honorary degrees from Western Reserve University, the University of Glasgow, and other celebrated institutions of learning; professor of physiology; professor of the principles and practices of surgery and of clinical surgery; Brigadier General Surgeon in the United States Army; professional director of a United States Army Base Hospital; recipient of the Distinguished Service Medal from the United States, and of the Cleveland medal for public service; decorated by the Republic of France with the Legion of Honor; author of many books in the fields of surgery and medicine; fellow in numerous American and European scientific, medical, and honorary societies, including the Association of American Surgeons and the American College of Surgeons, whose many contributions to the causes, nature, and surgical and physical treatment of disease have enriched medical science and benefited suffering humanity.

Abraham Risel Hollender, distinguished son of Illinois, now attending Otolaryngologist at Miami Beach Hospital, Florida; Fellow of the American College of Surgeons; Fellow of the American Academy of Ophthalmology and Otology; formerly a member of the medical faculty of the University of Illinois; editor of the Eye, Ear, Nose and Throat Monthly; author of numerous articles on physical measures in otolaryngologic practice; author of a monograph on physical therapeutic methods in otolaryngology; Executive Director of the American Congress of Physical Therapy; for three years editor and then managing editor of the ARCHIVES OF PHYSICAL THERAPY, which publication has greatly contributed to the scientific measures in his specialty and whose services have in great measure been responsible for the success of the Congress.

Charles F. Kettering, distinguished son of Ohio, eminent engineer; General Manager of the Research Laboratories of the General Motors Corporation; in-

(*Continued on page 563*)

ARCHIVES of PHYSICAL THERAPY
OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.·. EDITORIALS .·.

THE CLEVELAND MEETING

The following report is submitted for the benefit of those readers who have been unable to attend the 19th annual convention of the Congress and even those who did attend but were unable to follow all activities and events during the sessions of the week ending September 7.

While all of the preceding meetings have offered excellent programs, the Cleveland session not only differed in some repects but saw certain organizational changes which are not without value to the members and others interested in the growth of physical therapy.

Cleveland proved an excellent locale for this year's convention. Apart from the fact that it ranks high as a medical center, the interest shown by the local medical profession and the cooperation given by its medical leaders proved highly gratifying. The attendance was all that could be desired, and it was noted that apart from our own active workers many new faces were seen in the attentive audiences, many having come from remote corners of our land in order, as they stated, to perfect themselves in our discipline. With these introductory remarks we will take up the various activities.

The *Seminar*, as was announced, was held in small groups through every forenoon, so that those registrants who desired only special information could devote themselves to them exclusively, in contrast to previous seminars which compelled all to take even such subjects which were of no particular interest to them or else absent themselves from the particular lectures and demonstrations. The division of all registrants into small groups rendered the courses more personal in nature and facilitated a greater exchange of opinions and better clarification of moot problems. All lecturers also gauged their lectures and demonstrations to their audiences, so that a repetition of elementals proved unnecessary and more stress was laid on practical clinical uses of physical measures in various fields of medicine. The consensus of opinion of many who have been interviewed was that whatever courses they had taken were of great informative value to them.

The *Scientific Exhibits*, which were installed before the opening of the Congress and filled a large section of the huge mezzanine floor of the spacious hotel, were unusually interesting both from a scientific and clinical point of view. The list of exhibitors announced in the program issue of the ARCHIVES can hardly convey an idea of the value of their interesting contributions. Many represented original scientific experiments and studies, others visualized actual conditions successfully treated by physical measures as photographs, transparencies or wax models in natural colors, so that many actually presented a course in diagnosis, pathology and therapeutic methods. Careful observers agreed that the Committee on Awards would have great difficulty in distributing the limited prizes. If one or the other group of clinicians who exhibited strikingly interesting material did not secure prizes, the Committee no doubt was motivated by reasons other than intrinsic merit, perhaps also because this year individual efforts were given preference over group presentations from richly endowed schools or hospitals.

The *Commercial Exhibits*, too, proved highly interesting. The Congress is

of course indebted to those firms which for a number of years have aided it financially by purchasing space, but even these firms showed new apparatus. There were a number of newcomers in the industrial field who presented comparatively new inventions or more practical improvements of older models of many instruments of precision or of apparatus for special electrotherapy, for which the reader is referred to the descriptive announcement of the published program.

The *Scientific Program* contained many valuable papers betraying considerable original research and clinical studies. The special addresses delivered by America's foremost authorities in various fields attracted large audiences. At this session those interested in otorhinolaryngology were numerous enough to constitute a large separate group, and the papers listened to were of highly scientific character — proof that those specializing in diseases of the eye, ear, nose and throat realize the value of physical measures in the management of a large variety of conditions.

The *Annual Dinner* presided over by President Polmer was not only one of the most enjoyable but one of the most surprising of any of its predecessors. The largest dining hall of the Statler Hotel proved barely large enough to seat the physicians, their ladies, the exhibitors and other friends, men and women, of the Congress. President Polmer's role as toastmaster was played with a skill at times under trying conditions, because the proper committee had discouraged set speeches but permitted humorous attacks on almost all prominent figures who were called upon to defend themselves against "charges" of unethical publicity presented by Hibben, of California, who exhibited faked scareheads in faked newspapers. The amusement reached its climax when the "accuser" unexpectedly was himself subjected to a similar "attack". Wit flowed and aided in the digestion of the excellent viands. The only serene moments were when Dr. Ewerhardt, of Missouri, as chairman, announced the awards for scientific exhibits, and Dr. Bierman, of New York, read the citations of seven recipients of the Gold Key of Merit awarded by the Congress. These are appended to this report.

Changes in Personnel. — Dr. Abraham R. Hollender, who for many years past has served as Executive Director of the Congress, announced his inability to continue in that capacity by reason of his removal from Chicago to Miami Beach, Florida. His place will be filled by Dr. Walter J. Zeiter, a leading physical therapeutist of Cleveland, who had rendered valuable services as a member of the local convention committee. The Congress properly selected Dr. Hollender as president-elect, to be installed as president at the 1941 meeting, which under a previous resolution is to be held in the national capital unless an unforeseen emergency should compel a change in locality.

Editorial Board. — To replace the old publication committee, it was decided to create an editorial board of five members for the purpose of easing the burdens of Dr. Disraeli Kobak, editor-in-chief of the ARCHIVES. It was felt that he should not be left to carry the entire load of editorial work, and that he should be provided from time to time with editorials, almost all of which had been written by him during the many years he has occupied the editorial tripod. The board is also pledged to aid in the shaping of any future policies to meet arising conditions and to lend material support to the official publication of the Congress. While it has received international recognition as the leading periodical in its field, it is believed that the selection of the editorial board will augur an even greater journal so as the better to represent the interests of physical therapy in the United States.

Election of Officers. — On Tuesday evening, September 3, after the formal addresses by the mayor of Cleveland and the presidents of the state and local

medical societies, Dr. William H. Schmidt relinquished his office as president and introduced Dr. Nathan H. Polmer, of Louisiana, as the incoming president. The election of the outgoing executive director, Dr. Hollender, of Florida, as president-elect was reported above. Dr. Fred B. Moor, of California, Dr. Kristian G. Hansson, of New York, Dr. Miland E. Knapp, of Minnesota, Dr. Walter S. McClellan, of New York and Dr. H. Worley Kendell, of Ohio were elected as vice-presidents in the order named. Dr. John S. Coulter, of Illinois, was elected treasurer to succeed himself, and Marion G. Smith, of Illinois, as executive secretary to succeed herself. The election of Dr. Zeiter, of Ohio, as executive director in place of Dr. Hollender, was already reported above. Dr. Disraeli Kobak, of Illinois, was elected editor-in-chief for a period of five years to begin at the expiration of his present term and empowered to have an associate or assistant. Past President Schmidt automatically becomes chairman of the Executive Council to replace Dr. Frank H. Krusen as successor in office. The Executive Council is composed of former presidents of the Congress.

ADDRESS OF WELCOME TO THE 19TH ANNUAL CONVENTION OF THE AMERICAN CONGRESS OF PHYSICAL THERAPY

The School of Medicine of Western Reserve University is happy to welcome your Congress to Cleveland for we are well aware of the great importance which the field of therapy represents, and of the greater importance which it may and will assume as our knowledge of the subject increases, which is the purpose of your gathering here.

I welcome you not only as an official of our School but as a pharmacologist as well, for although drug therapy and drugless therapy may seem direct antipodes to the superficial thinker, they involve the same principles, evoke the same phenomena, accomplish the same results. They differ only in the means which they employ, of which sometimes the one, sometimes the other is better adapted to secure the desired end. Indeed, the difference between physical therapy and pharmaco-chemical therapy are no greater than those between radiant and direct heat, or between local and general anesthetics. As you know, it has often been proposed that they should be united into one department. The only serious difficulty with that suggestion is that each already has its hands too full with its own problems to master those of another discipline especially as they do use rather different technics, and technics are often more difficult to master than principles. I imagine that you find this true even for different divisions of your own subject. Improvements in learning are more likely to come from intensive cultivation of a restricted field, with a general understanding and appreciation of the geography of the whole. On the other hand, it is an old observation that really *new* things are more likely to emerge from less cultivated borderlines in the no-man's land, or by poaching on the domains of other disciplines. The two ideas are not contradictory, for new fields must be explored intensively to yield their treasures.

So far as pharmacology is concerned, serious, intelligent and diligent poachers will not be treatd as trespassers but as honored guests, here and elsewhere, and be given a hearty welcome, with every good wish for their success, even as I have had the pleasure of welcoming you tonight and wishing you success in your deliberations.

TORALD SOLLMANN, M.D., Dean,
School of Medicine,
Western Reserve University,
Cleveland.

FELICITATIONS TO THE CONGRESS BY THE PRESIDENT OF THE OHIO STATE MEDICAL ASSOCIATION

I am privileged to welcome you to Ohio for the 1940 Session of the American Congress of Physical Therapy — officially, as President of the Ohio State Medical Association, and, privately, as a doctor of medicine practicing in this State. The medical profession of Ohio is honored and pleased to have you convene here. As its spokesman, I extend to you a hearty welcome.

Thinking and observing physicians are aware of the important and meaningful work your organization is doing. The value and practice of physical therapy were ignored for too long by the medical profession generally, and as a consequence, there are shortcomings in this field of medical service today which might otherwise have been avoided.

Thanks to the efforts of your Congress and other mutually interested groups, however, this important field of interest is making rapid progress. The need for a thorough acquaintance with the uses of physical methods, not only for the specialist but certainly for the general practitioner as well, more than justifies the existence of the American Congress of Physical Therapy.

A glance at your program indicates that this 1940 Congress session will probably equal, if not surpass, previous ones in scientific importance. A vast amount of that kind of teaching and learning which is so essential to the continued progress of medical science will be crowded into these next four days here in Cleveland. Not only will you improve your knowledge and skill, but your patients, the ultimate consumers of your services in whose interests you are attending the Congress, will inevitably be benefited.

You, as representatives of an important specialty in medicine, are to be congratulated for your past efforts and on the role you are playing in helping to extend the benefits of modern scientific medicine.

I bid you a most cordial welcome and trust that this 19th session of your Congress will be the most outstanding one in the history of your organization.

WM. M. SKIPP, M.D., President,
Ohio State Medical Association,
Cleveland.

AWARDS TO SCIENTIFIC EXHIBITORS

The Committee of Awards for Scientific Exhibits presented through its Chairman, Dr. Frank H. Ewerhardt, the following awards:

The Gold Medal to Dr. *Milton G. Schmitt*, Northwestern University Medical School, Chicago, for studies by semidiagrammatic drawings of the author's concept regarding optimal dosage in the use of short wave diathermy; also photographs and x-rays showing progress and results of cases treated by this technic.

The Silver Medal to Drs. *William Bierman* and *Mac Friedlander*, Mount Sinai Hospital, New York, for studies on the penetrative effect of cold by means of temperature determination of calf muscle, female pelvis, male urethra, stomach, brain, and the like.

The Bronze Medal to Dr. *S. H. Sedwitz*, Youngstown Hospital Association, Youngstown, Ohio, and Dr. *M. B. Ferderber*, Medical School, University of Pittsburgh, for studies on the diagnosis and treatment of peripheral vascular diseases (including veins).

Certificates of honorable mention were presented to the following:

Dr. *K. G. Hansson*, Hospital for the Ruptured and Crippled, New York, and Dr. *B. S. Troedsson*, Orange Memorial Hospital, Orange, New Jersey, for studies on cooperative measures in physical therapy.

Drs. *George L. Maison* and *A. G. Brocker*, Department of Physiology, St. Louis University School of Medicine, St. Louis, for studies on muscle training in man.

Dr. *Eugene Mittelmann*, Dr. *S. L. Osborne* and Dr. *John S. Coulter*, Northwestern University Medical School, Chicago, for short wave diathermy studies showing relationship between deep tissue temperature and power absorption by patient.

Awards of Merit

(*Continued from page 558*)

ventor of numerous electrical machines and devices for industrial, electrical, and transportation use; trustee of Antioch College; member of the Engineer Chemical Society, and of the American Academy of Sciences; a humanitarian and scientist; founder of the Kettering Foundation and the Kettering Department of Medical Research at the Miami Valley Hospital in Dayton, Ohio, whose study of the use and effectiveness of artificial fever has resulted in the clinical amelioration of grave infections of the skeletal and central nervous systems.

Disraeli Kobak, distinguished son of Illinois, assistant clinical professor of medicine at Rush Medical College of the University of Chicago; Chairman and Director of the Physical Therapy departments of Cook County and of Presbyterian Hospitals in Chicago; Past President of the American Congress of Physical Therapy; member of British and French medical societies; decorated by the Belgian government as Knight Commander of the Order of St. George and by the French Republic as an officer of the French Academy with grade of University Palms; for many years Editor-in-Chief of the ARCHIVES OF PHYSICAL THERAPY; internationally famed exponent of physical medicine, whose many outstanding original publications have greatly contributed to the advancement of scientific physical therapy, and whose indefatigable labors have brought about and insured international recognition for the ARCHIVES OF PHYSICAL THERAPY as the leading specialistic journal of the world.

Malcolm T. MacEachern, distinguished son of Ontario, Canada and now a citizen of the United States residing in Chicago; graduate of Medill University Medical School; formerly general superintendent of Vancouver General Hospital; director of Hospital Activities for the American College of Surgeons; chairman of the Administrative Board of the American College of Surgeons; lecturer at the Cook County Post-Graduate School of Nursing, member of the Editorial Board of the Modern Hospital Management magazine, President of the American Hospital Association from 1924-25, honorary president of the Western Hospital Association; President of the International Hospital Association; recipient of the award of merit from the American Hospital Association in 1939, and now for outstanding work in development of American Hospitals.

William Ferdinand Petersen, distinuished son of Illinois; professor of pathology at the University of Illinois College of Medicine; First Lieutenant in the Medical Corps of the United States Army; graduate of the University of Chicago; scientific investigator in the fields of immunity, enzynes, autonomic reactions of the skin, blood, and urine, and now distinguished as an eminent authority in the field of weather as a major factor in disease; author of a series of monographs on the Patient and the Weather, published from 1934 to 1938

and not yet completed, and the author of books dealing with protein therapy, skin reactions, blood chemistry, and the weather.

Horatio Burt Williams, distinguished son of New York; eminent physiologist; professor of physiology at Columbia University; member of the Council on Physical Therapy of the American Medical Association; graduate of Syracuse University; consultant to the Greenwich, Connecticut Hospital; Captain in the Engineer Reserve Corps; member of distinguished American and European Societies, including the American Physiology Society, the Physical Society of London, and the New York Academy of Medicine; contributor of articles to scientific publications, and whose research on problems of radio interference and other physical problems and whose publications of scientific monographs have proved of great value to the underlying fundamentals of physical therapy.

SCIENCE, NEWS, COMMENTS

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Society of Physical Therapy Physicians New Officers, 1941

President — Wm. Bierman, M.D., New York City.

President-Elect — F. H. Krusen, M.D., Rochester, Minn.

Vice-President — K. G. Hansson, M.D., New York City.

Secretary-Treasurer — Milton G. Schmitt, M.D., Chicago.

Membership Committee — Disraeli Kobak, M.D., Chicago; William H. Schmidt, M.D., Philadelphia; Jerome Weiss, M.D., New York City; Fred B. Moor, M.D., Los Angeles; Nathan H. Polmer, M.D., New Orleans.

Program Committee — Madge C. L. McGuinness, M.D., New York City; Richard Kovács, M.D., New York City; Frances Baker, M.D., San Francisco.

Editor — Disraeli Kobak, M. D., Chicago.

Meeting of the Section on Physical Therapy Medical Society of the County of Kings

The next regular meeting of the Section on Physical Therapy of the Medical Society of the County of Kings will be held in the Medical Society Building, 1313 Bedford Ave., Brooklyn, N. Y., Thursday, October 10, 1940, 8:30 P.M. sharp.

Subject — Poliomyelitis. A film from the United States Department of Labor Children's Bureau will be presented.

Commentators —

1. Kenneth Jennings, M.D., Pediatrition, Kings County, St. Mary's, and Kingston Avenue Hospitals, Brooklyn.

2. Joseph L'Episcopo, M.D., Orthopedic Surgeon, Long Island College, and Kings County Hospitals, Brooklyn.

3. John D. Currence, M.D., Director, Physical Therapy, Post Graduate Hospital, New York.

The medical profession is cordially invited.

JOHN J. HAUFF, M.D., President.
SAMUEL A. WARSHAW, M.D., Secretary,
1373 Ocean Parkway, Brooklyn, N. Y.

Sex Gland Disturbances May Cause Some Cancers

Upset in the balance between male and female sex hormones in either men or women may be an important factor in the development of some types of cancer, Drs. V. Korenchevsky and K. Hall, of the Lister Institute of Preventive Medicine, London, England, suggest on the basis of their latest experiments. Details of the experiments, in which pre-cancerous changes occurred in rats when the male-female sex hormone balance was shifted, are reported in *Nature*. — *Science News Letter.*

Tooth Decay Remedy Made by Sulfanilamide Discoverer

A chemical weapon against tooth decay that may prove as effective as sulfanilamide is against streptococcus infections was announced by Drs. Benjamin F. Miller, Sigmund Bradel and John A. Muntz, of the Zoller Memorial Dental Clinic of the University of Chicago, in a paper presented before the meeting of the American Association for the Advancement of Science in Columbus.

The new anti-caries chemical, called Zephiran, was made by the man who gave sulfanilamide to the world and who was awarded the 1939 Nobel Prize for this achievement, Prof. Gerhard Domagk, of the I. G. Farbenindustrie in Germany.

Long-term studies of Zephiran on patients suffering from dental caries are now under way, following the promising results of laboratory experiments with it, the Chicago scientists stated.

When it was swabbed on the teeth of patients in preliminary trials, it stopped lactic acid production after two minutes of swabbing, and prevented any increase in general acidity. Since lactic acid in high concentration can destroy tooth enamel and thus give decay a chance to start, Zephiran promises to be a potent weapon against tooth decay.

Zephiran was tried after the Chicago scientists had found that two other chemicals, sodium fluoride and iodoacetate, markedly reduced the amount of experimental caries or tooth decay in rats. These two chemicals, it was believed, checked decay by interfering with enzyme processes involved in the growth or metabolism of bacteria associated with the decay process. Fluorine in drinking water, cause of the ugly mottled enamel condition of teeth, had previously been found by other investigators to play a role in caries prevention.

Search for a better and less poisonous substance than sodium fluoride or iodoacetate to use on human patients led to the trials of Zephiran. This substance is, in chemical terms, alkyl dimethyl benzyl ammonium chloride. It is a powerful germ-killer. In addition, it acts as a cleansing agent, is relatively harmless to mucous membranes such as line the inside of the mouth, and it lowers the surface tension of water. This last property is important because it means the chemical is a good wetting and penetrating agent and can get into effective contact with the dense mass of germs in the dental plaque. Dental plaques are deposits on the teeth of material supposed to act as a medium for the lodgment of germs associated with the decay process.

Zephiran-swabbed and unswabbed plaques were removed from patients' mouths and studied in the preliminary trials. It was in these trials that the inhibition of lactic acid formation was discovered. — *Science News Letter.*

Sex Hormone Treatment May Speed Bone Knitting

Knitting of broken bones, especially in elderly women, may be speeded by treatment with the female sex hormone, theelin, Dr. G. A. Pollock, of the Mayo Foundation, declared as a result of studies of the effects of theelin on broken bones in laboratory animals.

Women over 60 years of age get so-called "broken hips" with "striking" frequency, Dr. Pollock pointed out. The condition, although popularly known as a "broken hip," is actually not a break of the hip but of the neck of the thigh bone near where it is joined to the hip.

Of 23 persons with this kind of fracture who were of comparable age, 22 were women in the series Dr. Pollock studied. This fact plus others showing a change in the bones of older women suggested a relation to the cessation of ovarian function in women past 50 years. Several other scientists, Dr. Pollock found, had also noted a relation between female sex hormones and bone formation.

Theelin, the female sex hormone, was given to elderly female rats and to females from which the sex glands had been removed, and the healing of broken bones compared in these groups with the healing of bones in similar animals that got no theelin and in young animals that were producing their own sex hormone and other young rats given doses of theelin. The broken bones knit faster and in more cases in the sex-hormone treated groups than in the non-treated groups.

The number of animals in the study was small, Dr. Pollock pointed out, and more work will be needed before the findings can be permanently established.

"However," he said, "the results which followed the administration of theelin are sufficiently striking to justify publication of the preliminary report as well as to indicate that ovarian secretion appears to influence calcification and, in the case of fractures, may accelerate solid union." — *Science News Letter.*

Oxygen Reported to Bring Mentally Ill Back to Reality

Mentally sick patients may be brought back to the world of reality by a new treatment developed from submarine and deep-sea diving investigations. Oxygen may produce the sanity-restoring shock now accomplished in some cases by insulin, metrazol or nitrogen, Lieut. Albert R. Behnke, U. S. Navy surgeon, told the American College of Physicians in Cleveland.

Victims of heart disease and of sinus trouble may also be helped, Lieut. Behnke said, by applying what naval authorities have learned about the effects of oxygen, other gases, and pressure on the human body.

For heart disease patients oxygen treatment might be much more widely used than it now is, he said. For the sinus sufferers, he recommended positive pressure, like a trip under water in a submarine. Small pressure chambers to achieve the effect in the nose-and-throat specialist's office might be used. Suction, used in an attempt to make breathing through stuffy noses easier, has done much harm, he believes. Instead, he advises positive pressure up to 10 pounds per square inch in the pressure chamber, followed by subsequent release of the pressure. This would provide effective ventilation and drainage with minimum injury to nasal tissues.

Physical fitness can also be measured in the pressure chamber. Such a test used in the Navy showed that only 10 to 15 per cent of qualified submarine personnel could not tolerate pressures of two or more pounds per square inch. Among civilians, only about 50 per cent can pass this pressure test. — *Science News Letter.*

Benzedrine Sulfate Use May Lead to Addiction

Spectacular as the effects of amphetamine sulfate (benzedrine sulfate) may be as a "pepper-upper" and in the treatment of obesity, it has among other dangers, that of producing addiction with deleterious results from long continued use, warns Dr. Sidney Friedenberg of Camden, N. J. (*Journal American Medical Association.*) — *Science News Letter.*

New Technic in Amputation to Prevent Deaths

A new life-saving technic has been added to one of the oldest of surgical procedures, amputation of a leg. Details of the technic with successful results in 28 consecutive amputations of the thigh are reported by Dr. J. Ross Veal, Gallinger Municipal Hospital, Washington, D. C. (*Journal, American Medical Association*).

When death follows amputation of a leg for vascular gangrene in patients with arteriosclerosis, diabetes and thrombo-angiitis obliterans, as it does in about one-third of the cases according to Dr. Veal's figures, lung complications are the most important cause of the deaths.

These are due not so much to infection, Dr. Veal found, as to tiny blood clots torn loose from a large clot at the end of the femoral vein in the stump left after amputation. The little blood clots are swept along the blood stream to the lungs where they become lodged and cause the fatal complication.

To avoid this, Dr. Veal, before amputation, ties off the femoral vein high enough so that a moving stream of blood from large tributary veins can prevent the formation of a dangerous clot in the femoral vein. — *Science News Letter.*

The Effect of Heat, Cold and Weather on the Human Being — Petersen

(*Continued from page 532*)

Toxicity of Morphine Sulfate, J. Lab. & Clin. Med. **23**:1063 (July) 1938; The Cold Front and the Toxicity of Morphine Sulphate, Bioklimatische Beiblätter **1**:26, 1939.

9. Ellinger, F. E.: Die Lichtempfindlichkeit der menschlichen Haut, ihre Bestimmung und Bedeutung für die lichtbiologische Konstitutionsforschung, Strahlentherapie **44**:1, 1932.

10. Selye, Hans: Prevention of Adrenalin Lung Edema by Alarm Reaction, Am. J. Phys. **122**:347 (May) 1938; Ueber den Einfluss der Alarmreaktion und der Histaminbehandlung auf den Wasserstoffwechsel bei Nierenschädigung, Klin. Wchnschr. **17**:666 (May 7) 1938.

11. Hoverson, E.T.: A Case of Hyperpyrexia in Artificial Fever Therapy, Am. J. M. Sci. **186**:557 (Oct.) 1933.

BOOK REVIEWS

KING GUSTAF V's STOCKHOLM JUBILEE CLINIC FOR RADIOTHERAPY AND RESEARCH IN CANCER. A Description by *Gösta Forssell; Elis Berven; Olle Reuterwall* and *Rolf Sievert.* Paper cover. Pp. 80. Price, Swedish Cr. 8.00 net. Stockholm: P. A. Norsted & Söner. 1939.

In contrast to all preceding supplements of the Acta Radiologica, the present one, which is numbered 38, represents not a scientific monograph but an account of a celebration of the world famous Radiumhemmet, of the Radio-pathology Institution and of the Radiophysics Institutions all now grouped as part of the University hospital service in Stockholm. The first two named authors need no introduction to American readers, but specialists in radiotherapy and those engaged in cancer research will recall the many scientific contributions by the other authors of this account of their King's jubilee clinic held on June 11, 1938. The narratives and the addresses by outstanding scientists present an accurate account of the modest beginning and economic struggles of the radiumhemmet, a story which should prove an inspiration to all humanitarian scientists who have enough social influence to secure the cooperation and financial aid of private individuals or of state authorities in their desire to establish institutions devoted to the relief of suffering humanity. The addresses do not lend themselves to a review and must be read in detail to realize the value of the present institutions. This monograph presents 8 ground plans of the buildings and 32 photographs of the buildings and their radiologic and other installations. Here it may be stated that in spite of a certain grandeur in an architectonic sense and the costliness of the radium and Roentgen equipment, the laboratories and treatment rooms manifest an almost Spartan simplicity. These too do not lend themselves to a review and must be seen to be appreciated. The monograph is of particular interest to all who desire detailed information about the Radiumhemmet and affiliated institutions.

PRINCIPLES OF ORTHOPEDIC SURGERY. By *James Warren Sever,* M.D., Assistant Professor of Orthopedic Surgery, Harvard Medical School; Orthopedic Surgeon, Children's Hospital, Boston; Associate Surgeon, Boston City Hospital; Orthopedic Surgeon, Cambridge Hospital, Cambridge, Mass.; Medical Director to the Industrial School for Crippled and Deformed Children, Boston, Mass., etc. Third Edition. Cloth. Pp. 410. Price, $3.25. New York: The Macmillan Company, 1940.

The author, himself a noted teacher of orthopedic surgery has long felt that the lectures given medical students and nurses in his specialty have proved inadequate for the proper care of orthopedic patients in hospitals by both interns and nurses. The book, which first was published in 1924 and necessitated a second edition about eight years ago, does not pretend to be a textbook in the common acceptance of that word, but is also more than a mere synopsis, for it makes a serious attempt to give medical students and advanced nurses a clear insight into the underlying principles of orthopedics and takes up many technical details not emphasized in standard works. By text and numerous illustrations, including x-ray reproductions the author describes this field of endeavor systematically and lucidly in a manner to maintain the interest of the student. In twelve chapters one finds all diseases of an orthopedic nature well described. Operative and corrective procedures are explained sufficiently to convey at least a good idea of their technics, and the mechanical measures, such as bandaging, splinting, casts, and the like are given at such detail that careful readers will find them to be excellent guides even to the extent of avoiding common errors. A rather brief chapter is devoted to such physical measures as radiant light and heat, manipulation, muscle training, ultraviolet radiation and massage, but diathermy is omitted perhaps unintentionally. It is noted that in the discussion of arthritis the physical measures recommended are baths, stupes, local baking with radiant heat, the application of liquid paraffin and underwater exercise. Since these measures are most often carried out by nurses they could have profitably been discussed in greater detail and diathermy included at least in its broadest aspects. For the purpose intended his book is a reliable guide.

A TEXT BOOK OF X-RAY DIAGNOSIS. By British Authors in Three Volumes. Edited by *C. Cochran Shanks,* M.D., M.R.C.P., Honorary Director, X-Ray Diagnostic Department, University College Hospital, etc., etc.; *Peter Kerley,* M.D., M.R.C.P., D.M.R.E., Physician to the X-Ray Department, Westminster Hospital, etc., and *E. W. Twining,* M.R.C.S., M.R.C.P., D.M.R.E., Radiologist, Royal Infirmary, Manchester; Radiologist, Christie Hospital; etc. Volume III. Cloth. Pp. 800 with 710 illustrations. Price, L 3.3.0 net. London: H. K. Lewis & Co., Ltd., 1939.

No more beautiful and scholarly a text has come before the eyes of the reviewer than this the last of three volumes forming the most comprehensive textbook of x-ray diagnosis contributed by our British colleagues. It is saddening to note that one of its three editors, Dr. Twining, lived only long enough to complete his indefatigable task and can only share

the glory of this accomplishment in a posthumous fashion. Because of the long interval that elapsed between the issuance of the third and the first two volumes it will be recalled that the latter dealt with the thorax and abdomen, while the most recent is devoted to an exposition of the skeletal and nervous systems. The present volume includes contributions from 18 outstanding clinicians and radiologists of Great Britain, and of an even larger number who by their aid in the form of illustrative material have made it possible to raise the quality of the exposition to the level of "a comprehensive survey of the present position of x-ray diagnosis." The text proper is divided into six parts, one of which (part three) because of its great length of necessity is subdivided into many sections. In each instance the discussion attempts to produce a rounded exposition and thus includes suggestions as to technic in normal and pathologic processes, guidance as to certain special radiologic features of the cranium and other sections of the skeletal system. The work is so rich in data, special instruction and illustrations that it assumes the character of an encyclopedic contribution. No progressive student or radiologist can afford to be without this elaborate and authoritative work on x-ray diagnosis.

STEDMAN'S PRACTICAL MEDICAL DICTIONARY OF WORDS USED IN MEDICINE WITH THEIR DERIVATION AND PRONUNCIATION INCLUDING DENTAL, VETERINARY, CHEMICAL, BOTANICAL, ELECTRICAL, LIFE INSURANCE AND IN OTHER SPECIAL TERMS, ETC., ETC. By *Thomas Lathrop Stedman*, A.M., M.D., and *Stanley Thomas Garber*, B.S., M.D. Fourteenth revised edition with Etymologic and Orthographic rules. Pp. 1303 with illustrations. Price, $7.00. Baltimore: The Williams & Wilkins Company, 1939.

Stedman's Medical Dictionary has proved itself a medical necessity for students, practitioners, dentists, and all workers in allied fields of medicine. The fourteenth edition introduces a new editor, who began his literary labors as a collaborator of the late Dr. Stedman and now assumes full responsibility by authority of past recognition for his meticulous scholarship. The present edition contains many new titles and subtitles including many new definitions and synonyms of recently isolated hormones, vitamins and chemical compounds of therapeutic interest and value. To cite but one example one finds under L a concise explanation of the Lindbergh pump. Of interest to students and teachers is the inclusion of all the changes in the first supplement of the eleventh edition of the U. S. Pharmacopeia and the new British anatomical terms suggested by the Basle anatomical nomenclature with their B. N. A. equivalents. Despite extensive revisions and additions, this dictionary retains its pliable compactness and scholarly terseness. Stedman by his patient and persistent labors influenced the purification of medical orthography in the English language as few others, hence this work stands as a monument to his memory. A worthy gesture would have been the placement of his photograph as the frontispiece instead of the Hippocratean oath.

DISPLACEMENT OF THE CALCIFIED PINEAL BODY IN ROENTGEN PICTURES AS AN AID IN DIAGNOSING INTRACRANIAL TUMORS. AN ANTHROPOMETRICAL-STATISTICAL ANALYSIS. By *Bength Lilja*. Paper cover. Pp. 182. Price, Swedish Cr. 10.00 net. Stockholm: P. A. Norsted & Söner. 1939.

This monograph is the 37th supplement to the periodical Acta Radiologica, and is issued from the State Institute of Human Genetics and Race Biology in Upsala. It is in the main a highly interesting radiologic study of the pineal body in health and as a diagnostic measure in the presence of brain tumors. The author takes the standpoint that after the age of twenty calcification of the pineal body is radiologically demonstrable in at least 40 per cent of the cases. There is a normal range of variation in the position of this gland when examined with the aid of Lysholm's special table for skull examinations. Having at his disposal a large number of individuals without clinical symptoms, he succeeded in establishing the radii and diagonals of the positions and evaluated them from the roentgenologic, anthropometric and statistical points of view. While this part of the study is of interest to men who devote themselves to the various aspects of anthropology, another section dealing with its diagnostic value in the presence of intracranial tumors is of particular value to all clinicians. For this study the author utilized no less than 217 tumor cases operated on by the neurosurgeon, Professor Olivecrona. The study is replete with diagrammatic sketches, mathematical tables of measurements and many devoted to statistical analyses. Nor is this material utilized for purely abstract purposes. Although the text proper is highly technical, too much so perhaps for diagnosticians and surgeons not specializing in growths of the central nervous system, the explanations and conclusions drawn are lucid, so that the monograph provides valuable information to enhance the present diagnostic facilities for the neoplasms under consideration. These monographic supplements to one of the outstanding periodicals of radiology have been generally recognized as of a high scientific character, and the present one more than justifies their reputation for accurate and clinical progress.

INTERNATIONAL ABSTRACTS

Role of Posture in Chronic Arthritis. Henry H. Jordan.

New York State J. Med. **30**:1823 (Oct.) 1939.

From the viewpoint of body mechanics, we are dealing in atrophic as well as in hypertrophic arthritis, regardless of its etiology, with an abnormal condition, an inferiority or insufficiency of the framework of the body. One, or several, or all of the skeleton's most vital elements, the joints, may be the site of the original lesion or of secondary changes. Such is the interrelation of the structural elements of the body that loss of function of even one will affect the entire chain and seriously interfere with the equilibrium between the working capacity of the organic entity and the demands made upon it. This equilibrium essential for the well-being and efficiency of the individual, may be disturbed by abnormal demands made upon a normal body by pathologic weakness, or insufficiency of the organ.

The causative relation is twofold between chronic arthritis and posture. Deformity and loss of function of diseased joints disturb the statics and dynamics of the entire body or at least of some of its sections, and thus lead to defective posture. On the other hand, poor body mechanics, e.g., those due to constitutional inferiority of soft tissue structures, or localized muscular defects through infantile paralysis, throw abnormal demands upon the articular units of the framework, thus acting as an extrinsic factor and playing a role in the development of chronic arthritis. In any event, correction of posture is necessary in order to achieve the prophylactic or therapeutic purpose.

Faradic Shock Treatment of the "Functional" Psychoses. Nathaniel J. Berkwitz.

J. Lancet **54**:381 (Aug.) 1939.

On the basis of observations and experiences of the various treatments described by Bini, and Cerletti and Bini, the author began to study means of duplicating the physical procedure by means of faradic shocks to provoke physiologic reactions without producing harmful physical complications. Though of a harmless nature, faradic shock treatment also is accompanied by fear and apprehension such as is experienced in other forms of shock therapy.

The patient's breakfast is withheld and an enema is given before the commencement of the treatment. From five to ten shocks of one second's duration each are given with one second intervals between each shock. Such current can be safely tolerated in patients having no vascular disease. Physiological changes produced with such stimulation are reversible and harmless. The patient's eyelids and facial muscles twitch, the head jerks, and evidence of fear and pain is exhibited. The patient does not appear to be in mental anguish or to have the violent jerking as is seen in convulsions.

Immediately after the electrical shocks are given, pentothal sodium is injected intravenously to produce prompt sleep. From 4 to 7 cc. of a 5 per cent solution (50 mgm. per cc.) is slowly injected. Surgical anesthesia is attained in about thirty seconds. Unconsciousness lasts for several minutes depending upon the amount of the drug administered. When the patient becomes unconscious, the respirations are shallow. As with all barbiturates, death results from respiratory failure and accordingly the respiration must be watched very closely. A cotton butterfly made of a wisp of cotton is attached to the upper lip with one wing overlying the nostrils and the other wing overlying the lips, to note the pulmonary exchange of air. Only an expert anesthetist or one well versed in its administration and its dangers should employ pentothal sodium. By the administration of an inhalant such as spirits of ammonia, the patient may be kept awake. Thus, the interviewer often may gain much information of the content of his thought, which is not obtainable at other times. This same method is employed after the intravenous injection of sodium amytal. From ten to twenty daily treatments are recommended.

Chronic Arthritis — Differential Diagnosis and Special Treatment Methods: Medical, Orthopedic, Physical Therapy. Bernard L. Wyatt, Harry E. Thompson, and James Donald Francis.

New York State J. Med. **39**:2037 (Nov.) 1939.

Chronic arthritis does not develop overnight and should not be expected to disappear by magic. Moreover, the task of recovery is fundamentally a cooperative undertaking. Therefore, the first principle is that the physician present frankly and fully the problems with which the business partnership is confronted, and unless the patient is prepared to assume the obligations and responsibilities that will devolve upon him, it is far better not to start at all. A second principle is that patients in one clinical group require materially different composite programs of therapy than those in another. A third principle is almost equally obvious and relates to the individual and personal requirements of each patient. Finally, between 85 and 90 per cent of all deformities are preventable, and the neglect promptly to initiate means of preventing flexion contractures and other disabilities is reprehensible.

Effective treatment is dependent upon early diagnosis, which in turn calls for thorough case histories and examinations. Every year that an arthritis exists untreated affects the chances of complete recovery to some extent, although delays vary in their importance to individual patients.

The majority of patients have heard altogether too much about the need for exercise and not nearly enough about the importance of rest. The technic of passive, assistive, free and resistive exercises to meet individual requirements necessitates that every arthritic joint should be taken through its painless range of motion several times daily. Patients should perform therapeutic exercises in a heated pool and follow them by a sun bath on the lawn surrounding the outdoor pool. Such a combination of hydro- and heliotherapy is especially recommended for individuals with wasted muscles and impaired joint function due to contractures.

The benefits of a warm, dry, and sunny climate with minimal barometric fluctuations are beyond question, because it is under such conditions that continued sun bathing over long periods may most readily be indulged in and is most thoroughly enjoyed. The heat relaxes and softens while cold stiffens and tightens tissues.

Radiant heat generators seem to be more generally employed in the treatment of the arthritides than any other single type of equipment. This is doubtless accounted for by the fact that great symptomatic benefit usually follows their use and that they are relatively inexpensive and easily operated. Not only are infra-red radiations of value per se, but the beneficial results are materially improved when they are utilized in conjunction with climatic conditions characterized by warm, dry sunshine.

The galvanic current, unlike all other forms of electrical demonstration, has not only physical but also chemical effects.

Ionic medication is employed to obtain a change in the nutrition of postinflammatory areas. Different kinds of ions have different effects upon tissues. Histamine and mecholyl are the therapeutic agents used.

The production of generalized deep tissue heat (with wave lengths ranging from 12 to 30 meters) stimulates the defense mechanisms of patients with chronic infections atrophic arthritis was demonstrated pictorially. The greatest benefits seem to follow very slight elevations of body temperature — 101 F. or less.

Local short wave diathermy should be included in the program.

Rules for Physical Therapy. John S. Coulter, and W. H. Northway.

The Modern Hospital **53**:54 (Aug.) 1939.

The first thought in establishing a physical therapy department in a medium sized general hospital must be on proper personnel. Many departments with good equipment and poorly trained personnel failed, but good personnel, with or without elaborate equipment, produced success.

The part-time services of a medical director are necessary. Arrangements may be made with a physician who is supervising one or more hospital physical therapy departments. The intern on laboratory service should see new cases referred to this department when the director is not present and should become familiar with all types of treatment given.

Treatment should be administered by trained physical therapy technicians who are graduates of a recognized school for physical therapy and are registered with the American Registry for Physical Therapy Technicians. The technician in charge should have had preliminary training as a nurse. All technicians should be members of the American Physiotherapy Association.

Day Camp for Convalescents. George Kojac.

The Modern Hospital **54**:66 (Feb.) 1940.

For the poor in New York City, the period of convalescence is not necessarily a problem period because it often brings into play the resources of carefully equipped and medically supervised convalescent homes conducted by charitable organizations.

The convalescent day camp of the department of hospitals, conceived and created by Dr. S. S. Goldwater, the commissioner, introduces a unique and appealing service, providing convalescent facilities and care for children and adults in an outdoor environment and with modern facilities and equipment.

Occupational therapy as a prescribed treatment not only gives necessary exercise for mind and body but prevents restlessness and over-activity and dissipates the tendency toward hypochondriacal ideas. Arts and crafts and recreational activities are adapted to develop strength in certain muscles weakened from disuse and to assist in increasing motion in joints stiffened from disuse or injury. Occupational therapy is administered by competent personnel since over-activity or ill-advised work may do more harm than good. Play exercise is given high rank among the curative agencies.

Tendon Injuries. Clifton W. Henson.

New York State J. Med. **39**:1265 (July 1) 1939

Aseptic tenosynovitis responds quickly to immobilization, the symptoms disappearing within three to six weeks, rest being obtained by any reasonable method of splinting, preferably of molded plaster.

When the symptoms are of mild degree and the occupation does not require a continuance of the manipulation causing the condition, partial immobilization may be attempted. Radiation and diathermy are often used in conjunction with rest, but it is doubtful if they are beneficial.

Immediately upon suspicion of infection of a tendon sheath, lateral incisions should be made into the entire portion involved. Care should be

exercised to avoid natural constricting bands and joints. When the inflammation subsides, the continuous soaks may be replaced by a dressing that is saturated with the same solution three times daily. This assures drainage without keeping the tissues in an abnormal medium. Active motion should be encouraged.

Massage must be postponed until two weeks after complete disappearance of the inflammatory signs. The treatment then consists of infrared radiation three times weekly followed by massage and active and passive motion. Passive motion should never be forced, but may be used to demonstrate to the patient the increase in active motion expected upon the next observation.

Coronary Occlusion. William Hall Lewis.

J. A. M. A. **114**:484 (Feb. 10) 1940.

The history of a patient who suffered an attack of acute coronary thrombosis is considered noteworthy not because of the disease but because of the activities which the patient has been able to maintain, following careful treatment for the acute condition. His business career was resumed on the basis of his capacity to meet its demands. The scope of the demands enlarged considerably and entailed a degree of activity beyond that advised and considered possible. In addition, because of his active temperament, flying at various altitudes up to 15,000 feet, dancing, swimming, and skiing each winter at altitudes up to 10,000 feet have all been accomplished apparently without detriment.

This report is published to encourage those who have suffered from coronary thrombosis in the expectation of being able to pursue normal activities without too severe restrictions. The range of activities can be gauged only according to the capacity of the individual.

Aortic Regurgitation and Mitral Stenosis in Marathon Runner. Ernst Jokl., and M. M. Suzman.

J. A. M. A. **114**:467 (Feb. 10) 1940.

A marathon runner was observed to have mitral stenosis and aortic regurgitation. The significance of this case is worthy of note in view of current opinions on the subject of the alleged dangers of exercise to persons suffering from valvular disease of the heart. The recently adopted more liberal prognostic interpretation of systolic murmurs may also be tenable with regard to uncomplicated valvular heart disease presenting diastolic murmurs when these are due to combined aortic regurgitation and mitral stenosis or to aortic regurgitation alone, of rheumatic origin.

Improved Treatment of Cervicitis by Copper Ionization. Jerome J. Bredall.

J. Missouri M. A. **36**:403 (Oct.) 1939.

With the patient in the dorsal recumbent position and the moist indifferent electrode placed under the buttocks and connected to the negative pole of the galvanic machine, the cervix is exposed with the vaginal speculum and the cervix wiped dry of secretions. In virgins, the author uses a large Kelly cystoscopic tube or a small speculum. The cervical canal is sounded and dilated if necessary. The largest copper electrode that will enter the cervical canal snugly is introduced up to the internal os. With the special electrode there is no danger of going past the internal os because of the small shoulder. The electrode must fit snugly. It is attached to the positive pole of the galvanic apparatus and the current turned on slowly up to 8 to 20 milliamperes. After twenty minutes of treatment the current is turned off slowly, the poles reversed on the electrodes and the current turned up again to 5 and 10 milliamperes until the cervical electrode loosens up and can be removed easily. On inspection one will find the cervical canal lined with light green crystals of copper oxychloride which adhere tightly to the mucosa.

A ball electrode is used to take care of the erosions or eversions which extend so far on the vaginal portion of the cervix that the regular cervical electrode will not come in contact with them. The diseased tissue can be easily contacted with this ball electrode and and it may be used by itself a few times before or after the use of the cervical electrodes. The use of the ball electrode will lessen the number of treatments necessary for cure.

Treatments should be given not oftener than every ten days so that the reaction of the tissues may return to normal. Between treatments the cervix may be inspected and the superficial coagulated exfoliating mucosa swabbed away with an antiseptic solution. Every night the patient should use a douche of two parts of hot water containing acetic acid or lactic acid.

Short Wave Diathermy. Nathaniel H. Badaines, and Eleanor Barnard.

M. Bull. Vet. Admin. **17**:31 (July) 1940.

Badaines and Barnard's gratifying results were in a considerable number of hypertension patients. Success was obtained with the long-wave type, but markedly better effects were apparent with short-wave diathermy. Of about 50 patients so treated, all except one evidenced decided benefit; that patient had a severe cardiorenal complication. The hypertensive group, after the first few treatments by short-wave diathermy, reported disappearance of their characteristic headache, vertigo and restlessness, together with a general feeling of well-being. Physical examination showed corroborative findings, as reflected in drop in the blood pressure. In 20 of these patients, a reduction of several millimeters of pressure was recorded after the first treatment.

The procedure in the hypertensive group was first, to examine the patient, check his blood pressure, and prescribe such drug treatment as appeared necessary, and then to refer him to physical therapy. Actual technic consisted of placing him in supine, comfortable position, with head elevated. All metal objects are removed.

The inductance coil is draped around the back of the neck and down the sides of the body, with several thicknesses of toweling between the skin and the coil and a moderate amount of current introduced for about 20 minutes. The patient is closely watched for appearance of headache, dizziness or exhaustion, and is instructed to report any discomfort felt by him. He should experience a mild sensation of warmth and should perspire freely. If these evidences are not exhibited, treatment should be discontinued. Upon completion of treatment, the patient's blood pressure is recorded after which he is sent back to bed in his ward. Treatment is carried out daily for one week, and then three times a week for three or more weeks.

Finsen Light Therapy in Lupus Vulgaris. S. Lomholt.

Strahlentherapie 67:172 (Jan. 31) 1940.

Lomholt reviews the evolution, construction and operation of Finsen apparatus for lupus vulgaris and the successful results achieved either by local irradiation or by supplementary light baths of the body. Of 187 patients, 175 (96.7 per cent) were cured. Reexamination, after a period of years, of 350 patients, representing a section of the country whose past history was one of serious and neglected cases, showed 76.5 per cent healed and 16 per cent with smaller and 7.5 per cent with larger infectious traces. Two-thirds of all patients were women. The therapy consists of from four to six series of treatments (direct current, 40 ampere lamp intensity) lasting from twenty to thirty minutes each and extending from two to three weeks and leaves soft smooth scars with a minimum of disfigurement. Patients report for periodic reexaminations. The author points out that a parallelism was found statistically between the incidence of pulmonary tuberculosis and lupus vulgaris in different districts in the country. A bacteriologic test showed the presence of bovine tuberculosis in 45 per cent of 110 cases in which reaction was obtained, though lupus, contrary to the general belief, is not predominantly a rural disease and is found in countries, such as Norway and Finland, in which bovine tuberculosis is practically unknown. [J. A. M. A. 114:2345 (June 8) 1940.]

Ultraviolet Irradiation as Adjuvant to Chemotherapy of Seroresistant Dementia Paralytica. David L. Liberman, and Isadore Spark.

M. Bull. Vet. Admin. 17:33 (July) 1940.

Liberman and Spark believe that avoidance of ultraviolet erythema and pigmentation prevent exhaustion of the reticulo-endothelial system, and the nonspecific effects of ultraviolet irradiation are prolonged. They also call attention that seroresistance arises from a variety of causes and likewise has varied significance. In either event the interpretation of sero-resistance properly should be based on a careful evaluation of the ensemble, and not on the mere fact that the laboratory report shows a positive reaction serologic test for syphilis. They decry autohemotherapy used in combination with ultraviolet irradiation. Every patient was given individual consideration for chemotherapy, and the ultraviolet therapy merely as an adjuvant. Although it is well known that dementia paralytica responds equally as well to malarial treatment and chemotherapy, the authors believe that ultraviolet irradiation enhances the chemotherapy, effects a more rapid improvement, and occasionally causes a reversal of a persistently positive blood or spinal fluid. The only Negro patient treated in a series did not appear to do as well as the white patients; in fact his condition gradually got worse. Accordingly ultraviolet irradiation appears to enhance the effects of chemotherapy in white seroresistant cases of dementia paralytica. Patients appear to improve more rapidly, and occasionally the persistently positive blood and spinal fluid findings were reversed.

Short Wave Diathermy in Neurosyphilis. Percival G. Lasché.

M. Bull. Vet. Admin. 17:28 (July) 1940.

Experience with short wave diathermy in neurosyphilis led the author to draw the following general conclusions as to its therapeutic value:

(1) It is excellent in acute sinusitis and other minor painful conditions of the head and body where the application of internal heat is desired. (2) It affords relief for the pain of post-alcoholic neuritis, alleviates the stiff joints and muscles in acute and chronic arthritis, and benefits other painful conditions. (3) It is useful in selected cases of syphilitis meningoencephalitis when therapy by artificial fever is to be employed. The temperature attained must be not less than 105 F.; if spirocheticidal effect is to be obtained. On account of the discomfort involved, which often extends over 5 or 6 hours, the patient must be cooperative. Hence, patients who are essentially sane and competent react best to this form of therapy. The more psychotic patients are apt to become painstricken and uncooperative; and, if allowed to struggle, inevitably place that added strain on their hearts or vascular systems which is not desirable.